

Alaska Peninsula Salmon Enumeration and Escapement Sampling Procedures, 2013

by

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and

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April 2013

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



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Weights and measures (metric)		General		Mathematics, statistics		
centimeter	cm	Alaska Administrative Code	AAC	all standard mathematical signs, symbols and abbreviations		
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	H _A	
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	<i>e</i>	
hectare	ha			catch per unit effort	CPUE	
kilogram	kg			coefficient of variation	CV	
kilometer	km	at	@	common test statistics	(F, t, χ^2 , etc.)	
liter	L			confidence interval	CI	
meter	m			compass directions:	correlation coefficient	
milliliter	mL	east	E	(multiple)	R	
millimeter	mm	north	N	correlation coefficient		
Weights and measures (English)		south	S	(simple)	r	
	cubic feet per second	ft ³ /s	west	W	covariance	cov
	foot	ft	copyright	©	degree (angular)	°
	gallon	gal	corporate suffixes:		degrees of freedom	df
	inch	in	Company	Co.	expected value	<i>E</i>
	mile	mi	Corporation	Corp.	greater than	>
	nautical mile	nmi	Incorporated	Inc.	greater than or equal to	≥
	ounce	oz	Limited	Ltd.	harvest per unit effort	HPUE
	pound	lb	District of Columbia	D.C.	less than	<
	quart	qt	et alii (and others)	et al.	less than or equal to	≤
yard	yd	et cetera (and so forth)	etc.	logarithm (natural)	ln	
Time and temperature		exempli gratia		logarithm (base 10)	log	
	day	d	(for example)	e.g.	logarithm (specify base)	log ₂ etc.
	degrees Celsius	°C	Federal Information Code	FIC	minute (angular)	'
	degrees Fahrenheit	°F	id est (that is)	i.e.	not significant	NS
	degrees kelvin	K	latitude or longitude	lat. or long.	null hypothesis	H ₀
	hour	h	monetary symbols		percent	%
	minute	min	(U.S.)	\$, ¢	probability	P
	second	s	months (tables and figures): first three		probability of a type I error	
	Physics and chemistry		letters	Jan,...,Dec	(rejection of the null hypothesis when true)	α
		all atomic symbols		registered trademark	®	probability of a type II error
alternating current		AC	trademark	™	(acceptance of the null hypothesis when false)	β
ampere		A	United States		second (angular)	"
calorie		cal	(adjective)	U.S.	standard deviation	SD
direct current		DC	United States of America (noun)	USA	standard error	SE
hertz		Hz	U.S.C.	United States Code	variance	
horsepower		hp			population	Var
hydrogen ion activity (negative log of)		pH			sample	var
parts per million		ppm	U.S. state	use two-letter abbreviations		
parts per thousand	ppt, ‰		(e.g., AK, WA)			
volts	V					
watts	W					

ALASKA PENINSULA SALMON ENUMERATION AND ESCAPEMENT SAMPLING PROCEDURES, 2013

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April 2013

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This document should be cited as:

Johnson, R. H., and D. M. Wilburn. 2013. Alaska Peninsula salmon enumeration and escapement sampling procedures, 2013. [In] Alaska Peninsula salmon operational plans, 2013. Alaska Department of Fish and Game, Regional Information Report 4K13-03, Kodiak.

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ABSTRACT

In the Alaska Peninsula Management Area (Area M), weirs provide the primary mode of enumeration for a majority of the sockeye salmon escapements into area streams. Annually, the Alaska Department of Fish and Game (ADF&G) samples adult sockeye salmon *Oncorhynchus nerka* escapements from Nelson, Bear, Sandy, and Ilnik rivers, and Orzinski Lake weirs for biological characteristics (age, sex, and length). Out-migrating sockeye salmon smolt are also sampled for age, weight, and length at the Bear River weir.

In 1985, an expanded commercial salmon catch sampling operation was initiated in Area M. Commercial harvest samples combined with the escapement sampling provide the foundation for preseason run forecasts, escapement goal evaluation, and accurate assignment of the run to stock of origin (run reconstruction) to some North Peninsula systems. Sockeye salmon escapement from systems with weirs will be sampled throughout the 2013 season along with commercial catch from individual districts and sections in Area M. The overall goal of the project is to provide data to assist with the long-term management of the Area M sockeye salmon runs.

Operation guidelines for the five Alaska Peninsula ADF&G weir camps are presented, including weir installation instructions, salmon enumeration and sampling procedures, and general camp policies.

Key words: Alaska Peninsula, Area M, commercial salmon harvest, escapement, sampling, weir, operational plan, Chinook salmon, *Oncorhynchus tshawytscha*, sockeye salmon, *Oncorhynchus nerka*, coho salmon, *Oncorhynchus kisutch*, pink salmon, *Oncorhynchus gorbuscha*, chum salmon, *Oncorhynchus keta*.

INTRODUCTION

The basic function of fisheries management is to ensure sufficient spawning escapement while allowing the harvest of available surplus fish. In 2013 the Alaska Department of Fish and Game (ADF&G) crews will enumerate and sample escapements at Bear, Nelson, Sandy, and Ilnik rivers, and Orzinski Lake. Sockeye salmon smolt samples are also collected weekly at Bear and Sandy rivers when possible, serving as indices of outmigration, age composition, and smolt condition.

The age composition of salmon stocks is determined through sampling portions of the escapement and commercial catch. This data compared to data from previous years allows current runs to be evaluated in a historical context by identifying both sibling relationships and the parent year escapement. Correlation of factors such as parent year escapement size, management strategies, and subsequent returns, leads to better understanding of individual fisheries and higher quality management. In runs where specific sockeye salmon *Oncorhynchus nerka* escapement and catch data can be combined to estimate the age structure of the run, brood tables can be generated for more accurate run reconstruction and forecasting.

BACKGROUND

BEAR RIVER WEIR

The Bear River weir (56°02.24' N lat, 160°16.10' W long) is located approximately 400 m downstream of the outlet of Bear Lake, on the north side of the Alaska Peninsula (Figure 1). Bear River is home to the largest sockeye salmon run on the North Alaska Peninsula. The weir is roughly 50 m in length and the water depth varies from 1.0 m to 1.5 m.

A weir was first constructed in 1929 and operated annually by the federal government through 1932 at a site approximately 12 km downstream of Bear Lake near the confluence of the Bear and Mad Sow rivers, but the site proved logistically difficult to supply as there was no air strip nearby. From 1953 through 1960, a weir was installed just downstream of the Bear Lake outlet. From 1961 through 1985, ADF&G employees enumerated salmon using a partial tripod weir and

a counting tower. Since 1986 a full, river-wide, conventional tripod weir has been operated annually from late May through late August.

During the fall of 2007 high winds and major flooding occurred, shifting the river from its general course. Unfortunately weir materials were damaged and washed downriver. Due to river substrate changes and the loss and damage of materials reconstruction and relocation was necessary. In 2008, the weir was moved approximately 100 m downstream from the 1986–2007 location.

NELSON RIVER WEIR

The Nelson River weir (55°48.99' N lat, 161°14.05' W long) is located midway between the head of Nelson Lagoon and Sapsuk Lake (Figure 1). The weir is approximately 40 m in length with water depth varying between 0.6 m and 1.0 m. From 1962 through 1988, salmon were counted from a tower downstream of the present weir site. In 1989 ADF&G replaced the counting tower with a floating weir anchored to the stream substrate with railroad rails. Since 1989 the weir has been operated annually from late May through late July. The Nelson River tower previously operated until late August for a total estimate of Chinook (*O. tshawytscha*), sockeye, and chum (*O. keta*) salmon. Recently, the weir has been removed in late July because of budget constraints. In 2008, the Nelson River weir was reconstructed with new materials and still operates as a floating weir.

SANDY RIVER WEIR

The Sandy River weir (56°11.94' N lat, 160°01.53' W long) is located approximately 5 km below Sandy Lake (Figure 1). The weir is roughly 61 m in length with water depth varying between 0.6 m and 1.5 m. From 1962 through 1964, ADF&G employees counted salmon from a tower. The project was abandoned between 1965 and 1994 for budgetary reasons and because the river was often too turbid for accurate salmon counts using tower methods. A large conventional tripod weir was constructed in 1994 at the same location as the tower counting project. In 2002 the weir was moved roughly 2 km downstream to a location less prone to washout. Since 1994 the weir has been operated annually between early June and late July.

ILNIK RIVER WEIR

The Ilnik River weir (56°36.73' N lat, 159°34.28' W long) is located approximately 3 km below the Ilnik Village site (Figure 1). The weir is the longest in the state at about 150 m in length with varying water depth between 0.2 m and 2.0 m. The Ilnik River salmon escapement has been counted through a weir since 1990. Between 1990 and 1994 large conventional tripods were used. The weir's proximity to the Bering Sea and Ilnik Lagoon makes it subject to tidal influence and subsequent reversal of the current in the river. Tidal influence combined with unstable, sandy river substrate led to scouring and caused the weir to frequently lose its integrity. Various strategies were employed to remedy the situation but with limited success. In 1996 a full river-wide floating weir was installed with success. The weir is operated annually from late May through late July.

ORZINSKI (ORZENOI) LAKE WEIR

The Orzinski Lake weir (55°43.78' N lat, 160°05.70' W long) is located near the outlet of Orzinski Lake, approximately 1 km upstream of the river's terminus in Orzinski Bay (Figure 1). The weir is about 26 m in length and the water depth varies between 0.3 m and 0.6 m. Salmon

were first counted through a weir constructed in 1929 and operated annually by the federal government through 1941 (except 1933 when the weir was not operated). Since its reinstatement in 1990 the weir has been operated annually from early June through late July.

OBJECTIVES

LONG TERM

- Management of the salmon resources in the Alaska Peninsula Management Area by achievement of annual escapement objectives, forecasting improvement, development of stock-recruitment relationships to assess escapement requirements, and accurate assessment of stock composition.
- Develop a history of biological attributes and samples that may be used for genetic and long-term age studies.

SHORT TERM

- Enumerate salmon escapement by species and ensure interim escapement objectives are met throughout the season.
- Determine the sockeye salmon age, sex, and length composition for Bear, Sandy, Ilnik, and Nelson rivers, and Orzinski Lake.
- Determine the age, weight, and length composition of sockeye salmon smolt from Bear River.

SUPERVISION

The Assistant Area Management Biologist (AAMB) Dawn Wilburn and Area Management Biologist (AMB) Robert Murphy, both based in Port Moller, will supervise the Nelson, Bear, Sandy, and Ilnik river weir crews. The AAMB Nathaniel Nichols and the AMB Aaron Poetter, in Sand Point, will supervise the Orzinski Lake weir crew. Day to day operations, task scheduling, and ensuring work quality will be the responsibility of the crew leader designated for individual camps.

During the operation of the weir, assigned duties may take longer than 37.5 hours/week to accomplish. When this is expected at Bear, Sandy, Nelson, or Ilnik rivers, notify the AAMB in Port Moller, if this is expected at Orzinski Lake notify the AAMB or AMB in Sand Point prior to actually doing work in excess of 37.5 hours/week. They will decide what projects take priority and authorize overtime if necessary. No additional overtime may be worked or claimed unless it is first authorized.

METHODS

GENERAL WEIR PROTOCOLS

The main responsibility of a weir crew is to install and maintain a salmon weir for the purpose of escapement enumeration and sampling. Two ADF&G personnel will be assigned to each project and additional assistance, if needed, will be provided during weir installation and removal.

Weir maintenance is very important to keep the weir fish-tight and prevent washout. The weir must be kept clean of debris and the river substrate must be checked periodically throughout the

day to make sure that holes do not develop which may allow fish to escape. In deeper channels a dry suit and diving mask will be needed to visually inspect the weir for holes. A complete inspection of the weir and a full cleaning must be done at least once a day. During high water the weir should be checked and cleaned multiple times a day as needed.

Large numbers of fish (>200) should not be allowed to build up behind the weir. If fish accumulate behind the weir, they should be counted through the gate. A trap installed in the weir will allow salmon to be live-captured for sampling and collection of biological data on fish transiting the weir.

A sockeye salmon less than 16 inches (<400 mm) in length (mid-eye to tail fork) will be considered a “jack;” a fish which has spent only one year in salt water before returning to spawn (age-1). The number of jack and “net-marked” salmon (those salmon wounded in encounters with gillnets), as well as the ratio of males to females, are important factors when evaluating escapement quality. Typically the number of jack salmon is less than 10%. If the number of jack salmon, on a daily basis or for the season, is above 10%, the escapement objective may be increased to compensate for the reduction in reproductive potential. If the number of net-marked fish becomes excessive, or if the ratio of males to females becomes skewed, the escapement objectives may be increased to preserve escapement quality.

The daily and cumulative escapement form will be used to record the daily escapement counts (Figure 2). On the daily counting form, note the time period when the weir gate is opened, and daily and cumulative counts for adults, jacks, and other salmon species. Remarks such as weather, percentage of net marked fish, water levels, holes in the weir, approximate numbers of Dolly Varden *Salvelinus malma* or Steelhead *Oncorhynchus mykiss* passed, and other comments should be included in the remarks column to the right of the page. Additional comments can be included at the bottom of the page.

It is important to keep a daily logbook (Rite-in-the-Rain®) to document a detailed description of daily events such as weather information, water levels, maintenance performed, number of fish sampled, bear activity, personnel changes in camp, and so on. The weir crews at Nelson, Bear, Sandy, and Ilnik rivers will relay total daily counts and cumulative seasonal counts for each species to Port Moller during the normal radio or satellite phone schedule at 8:20 AM and 7:20 PM. The weir crew at Orzinski Lake will provide this information to Sand Point during the same schedule. When the project is completed all forms will be forwarded to Port Moller including daily counting forms, camp log books, and sampling log books containing raw data.

Procedures for sampling adult sockeye salmon can be found in Appendices A1 through A6. Procedures for sampling sockeye salmon smolt can be found in Appendices B1 through B4. General camp policies and equipment use can be found in Appendix C1.

BEAR RIVER WEIR

The weir on Bear River will be installed on approximately May 31 and will be removed around August 25. The Bear River weir will be located approximately 300 meters downstream of the lake in roughly the same location as 2012. Care should be taken not to interfere with the approach of airplanes landing at the local lodge’s landing strip upstream of the weir, and to offer mooring opportunities on the riverbank for lodge skiffs behind the weir. Detailed weir installation instructions for Bear River can be found in Appendix D1.

Two distinct runs of fish, an early run and a late run, characterize the Bear River escapement (Table 1). The escapement goal for the early run, June 1 through July 31, is 176,000 to 293,000 sockeye salmon. The late-run escapement objective from August 1 through August 25 is a minimum of 87,000 sockeye salmon. The late-run total goal, including the post-weir estimate of 30,000 fish, is 117,000 to 195,000 sockeye salmon. The goal for the entire season including the post-weir estimate is 293,000 to 488,000 sockeye salmon. Escapements may be increased if escapement quality is poor because of a high percentage of jack salmon.

Table 1.—Bear River weir sockeye salmon escapement management objectives.

Date	Escapement for period	Cumulative escapement
Early-run component:		
15-Jun	4,000 – 8,000	4,000 – 8,000
20-Jun	11,000 – 22,000	15,000 – 30,000
25-Jun	15,000 – 25,000	30,000 – 55,000
30-Jun	30,000 – 60,000	60,000 – 115,000
5-Jul	30,000 – 50,000	90,000 – 165,000
10-Jul	25,000 – 35,000	115,000 – 200,000
15-Jul	15,000 – 30,000	130,000 – 230,000
20-Jul	10,000 – 20,000	140,000 – 250,000
25-Jul	20,000 – 20,000	160,000 – 270,000
31-Jul	16,000 – 23,000	176,000 – 293,000
Total early-run goal	176,000 – 293,000	
Late-run component:		
5-Aug	15,000 – 30,000	191,000 – 323,000
10-Aug	20,000 – 35,000	211,000 – 358,000
15-Aug	17,000 – 35,000	228,000 – 393,000
20-Aug	15,000 – 30,000	243,000 – 423,000
25-Aug	20,000 – 35,000	263,000 – 458,000
Total late-run objective	87,000 – 165,000	
Post-weir objective	30,000	
Total late-run goal	117,000 – 195,000	
Season total escapement goal	293,000 – 488,000	

^a Escapement occurring during the July 26–31 period that results in the escapement to exceed the 23,000 fish upper escapement objective, will be applied to the late-run escapement objective beginning August 1–5. However, no more than 15,000 fish shall be applied to the late-run escapement objective. This will aid ADF&G in managing the late Bear River sockeye salmon run more effectively when the run is earlier than expected.

NELSON RIVER WEIR

The floating weir on Nelson River will be installed around June 1 and will operate until July 25. The location will be the same as previous years as indicated by the railroad rails located in the river about 100 meters upstream of the ADF&G cabin. Detailed weir installation instructions for Nelson River can be found in Appendix D2.

The sockeye salmon escapement goal range for the Nelson River system is 97,000 to 219,000 fish (Table 2). Escapements may be increased if escapement quality is poor because of a high percentage of net-marked fish, a high percentage of jack salmon, or a low female to male sex ratio. The estimated number of female sockeye salmon in the escapement should range from 50,000 to 110,000 fish by July 25. Management staff in Port Moller will direct the crew at the Nelson River weir to sample the escapement as needed to determine the male to female sex ratio of fish passing the weir. A daily dip-net sample of 100 fish is typical. The escapement goal range for Chinook salmon in the Nelson River system is 2,400 to 4,400 fish, though the actual number of Chinook salmon is generally estimated through aerial surveys.

Table 2.–Nelson River weir sockeye salmon escapement management objectives.

Date	Escapement for period	Cumulative escapement
30-Jun	30,000 – 60,000	30,000 – 60,000
5-Jul	20,000 – 45,000	50,000 – 105,000
10-Jul	20,000 – 50,000	70,000 – 155,000
15-Jul	15,000 – 30,000	85,000 – 185,000
20-Jul	10,000 – 25,000	95,000 – 210,000
25-Jul	2,000 – 9,000	97,000 – 219,000
Total escapement goal	97,000 – 219,000	

SANDY RIVER WEIR

The weir is typically installed around June 5 and will operate until about July 25. In 2002, the Sandy River weir was moved approximately 2 km downriver from the original 1994 location. The move was initiated in order to find a location less susceptible to washout during high wind and water events. The weir should be reinstalled in roughly the same location as it was in 2005–2012, after assessing the quality of the site in terms of river depth, channel development, and substrate stability.

Due to the notable fluctuations in water level and debris load that Sandy River experiences, extra precautions will be taken to secure the tripods during installation. After the stringers and catwalk are in place, sufficient sandbags should be stacked on the tripod platforms and against the back legs to hold the tripods securely when the panels are installed. Weir maintenance is especially important at Sandy River to minimize the force of the river on the weir. The weir will be kept clean of debris and checked as often as needed to ensure there are no holes for fish to escape through. Dry suits and diving masks will be needed to visually inspect the weir at least once a day to make certain that it is fish tight. Detailed weir installation instructions for Sandy River can be found in Appendix D3.

The Sandy River sockeye salmon annual escapement goal is 34,000 to 74,000 fish (Table 3). If weir counts are unavailable due to difficulties with the weir such as a high water event, aerial survey data will be used to estimate the escapement and manage the fisheries.

Table 3.—Sandy River weir sockeye salmon escapement management objectives.

Date	Escapement for period	Cumulative escapement
20-Jun	2,000 – 3,000	2,000 – 3,000
25-Jun	4,000 – 8,000	6,000 – 11,000
30-Jun	7,000 – 17,000	13,000 – 28,000
5-Jul	8,000 – 19,000	21,000 – 47,000
10-Jul	5,000 – 13,000	26,000 – 60,000
15-Jul	3,000 – 7,000	29,000 – 67,000
20-Jul	3,000 – 4,000	32,000 – 71,000
25-Jul	2,000 – 3,000	34,000 – 74,000
Total escapement goal	34,000 – 74,000	

ILNIK RIVER WEIR

The Ilnik River weir will be installed on approximately May 27 and will operate until July 20. The floating weir will be installed in the same location as in previous years. Weir maintenance is extremely important at Ilnik River to decrease the likelihood of the weir washing out or being submerged due to debris loading. The large amount of algae washing down from Ilnik Lake tends to accumulate on the panels and can force the weir to sink, allowing fish to escape over the top of the panels. The weir should be kept clean of debris and checked often to ensure there are no holes for fish to escape. In the deeper channels, a dry suit and diving mask will be needed to visually inspect the weir to make certain that it is fish tight. For a detailed discussion of the installation of the Ilnik River weir, refer to Appendix D4.

If weekly escapement sampling is not possible due to inclement weather or other circumstances, age (scales), sex, and length data will be collected (upon approval from Port Moller management staff) from the set gillnet fishery (if present) in Ilnik Lagoon.

The Ilnik River sockeye salmon annual escapement goal is normally 40,000 to 60,000 fish (Table 4). In 1972–1975, 1986–1987, 2005–2010, and 2012, the Ocean River, a tributary to the Ilnik River system, flowed directly into the Bering Sea rather than into Ilnik Lake. When this occurs, many of the fish bound for Ocean River do not pass through the Ilnik River system, and therefore do not pass the weir. For the years noted above, an average of 20% of the Ilnik River system escapement spawned in Ocean River. If the Ocean River were to flow directly into the Bering Sea during 2013, the Ocean River escapement objective of 8,000–12,000 sockeye salmon will be subtracted from the total Ilnik River escapement goal (Table 5).

Table 4.–Ilnik River weir sockeye salmon escapement interim management objectives if Ocean River flows into Ilnik Lake.

Date	Escapement for period	Cumulative escapement
20-Jun	5,000 – 8,000	5,000 – 8,000
25-Jun	5,000 – 7,000	10,000 – 15,000
30-Jun	5,000 – 10,000	15,000 – 25,000
5-Jul	5,000 – 10,000	20,000 – 35,000
10-Jul	10,000	30,000 – 45,000
15-Jul	5,000	35,000 – 50,000
20-Jul	3,000 – 7,000	38,000 – 57,000
25-Jul	2,000 – 3,000	40,000 – 60,000
Total escapement goal		40,000 – 60,000

Table 5.–Ilnik River weir sockeye salmon escapement interim management objectives if Ocean River flows directly into the Bering Sea.

Date	Escapement for period	Cumulative escapement
20-Jun	4,000 – 6,400	4,000 – 6,400
25-Jun	4,000 – 5,600	8,000 – 12,000
30-Jun	4,000 – 8,000	12,000 – 20,000
5-Jul	4,000 – 8,000	16,000 – 28,000
10-Jul	8,000	24,000 – 36,000
15-Jul	4,000	28,000 – 40,000
20-Jul	3,000 – 5,600	30,400 – 45,600
25-Jul	2,000 – 3,000	32,000 – 48,000
Total escapement objective		32,000 – 48,000

ORZINSKI (ORZENOI) LAKE WEIR

The Orzinski Lake weir project will be operated in the same location as in recent years, approximately 50 meters below the lake outlet, from about June 7 to August 5. For a detailed discussion of the installation of the Orzinski Lake weir refer to Appendix D5.

Sockeye salmon usually begin entering Orzinski Lake in mid-June, normally 50% of the annual escapement has been achieved by the second week of July. The Orzinski Lake sockeye salmon annual escapement goal is 15,000 to 20,000 fish (Table 6).

Table 6.–Orzinski Lake weir sockeye salmon escapement interim management objectives.

Date	Escapement for period	Cumulative escapement
1-Jul	1,500 – 2,000	1,500 – 2,000
9-Jul	2,250 – 3,000	3,750 – 5,000
16-Jul	3,750 – 5,000	7,500 – 10,000
23-Jul	3,750 – 5,000	11,250 – 15,000
7-Aug	3,750 – 5,000	15,000 – 20,000
Season total goal		15,000 – 20,000

ESCAPEMENT SAMPLING FOR AGE, SEX, AND LENGTH

The crews stationed at Bear, Nelson, Sandy, and Ilnik rivers, and Orzinski Lake will conduct sockeye salmon escapement sampling for age, sex, and length. Sockeye salmon will be the only species sampled. If the weir washes out, samples will be collected by seine if possible. Appendix A1 describes sampling and recording procedures.

The sample goal is 240 adult sockeye salmon per week for each system. The dates of the standard statistical week do not change from year-to-year; however, the day of week does. In 2013, the standard statistical week begins on Friday and ends on the following Thursday (Appendix A6). The goal of the sampling schedule is to obtain 80 fish per day over three non-consecutive days, totaling to 240 sampled fish. Generally 80 fish should be sampled for age, sex, and length on Friday, Sunday, and Tuesday. Weather, fish counting, and other duties will likely influence the exact sampling schedule, but sampling should be spread over three non-consecutive days. This will yield a more representative sample for the week. This schedule may be amended by the supervisor due to various factors, including mitigation of weekly fishing period effects on sampled populations.

Samples will consist of scales, length, and sex data. Scales will be mounted on a gum card with the corresponding data (sex and length) recorded using the Meazura MEZ1000 Rugged Digital Assistant or RDA (Appendix A2). Length will be measured from mid-eye to tail-fork (Appendix A3). Sex data will be determined by kype (nose) development or visual determination of the presence or absence of an ovipositor, eggs, or milt. It is imperative that all scales collected correspond to the length and sex data for that fish. Experienced personnel will provide training on these procedures for new employees.

SMOLT SAMPLING FOR AGE, LENGTH, AND WEIGHT

Outmigrating sockeye salmon smolt will be sampled at Bear River after the weir is operational. Smolt sampling at Sandy River will be attempted as time permits. A weekly sample of 200 smolt will be collected throughout the duration of the smolt outmigration. Smolt will be sampled for age, weight, and length composition. Appendix B illustrates sampling and recording procedures.

A smolt trap (fyke net) will be deployed on the first night of the sampling period for sampling the next day. The fyke net will be located in swift-moving current, generally near the main channel of the river. A good procedure is to attach the net behind the weir using the tripods as an anchor for the net. To avoid unnecessary mortality, check the net frequently shortly before or after dusk, when outmigration usually peaks. Weather conditions, such as heavy rain and southeast winds should also be considered when sampling as larger numbers of smolt can be forced downstream resulting in high mortality in the live box. The net will be fished as long as it is necessary to capture 200 smolt. If 200 smolt are not captured on Friday night, sampling will continue until the goal is met or until the following Friday, after which a new sampling week will begin.

GENERAL CAMP MAINTENANCE AND PROCEDURES

Well maintained camps and facilities allow projects to be accomplished comfortably and efficiently. Maintenance can usually be accomplished during slow periods of the season. As soon as the camp is established, facilities should be looked over and a list of projects that need to be accomplished made. The supervisor should be notified of any materials needed. Anticipate needs

before they become a problem. Ordering replacement parts before a deteriorating piece of equipment breaks will prevent long repair delays because of the logistics involved.

Appendix C1 provides general information including radio schedules, ordering food and supplies, compliance with ADF&G regulations, equipment/maintenance, procedures regarding fish and wildlife violation reporting, emergencies, firearms, bears, garbage, boating, fire and first aid safety, drinking water, personal gear, compatibility of field personnel, and cleanliness of cabin.

DATA REPORTING

Michelle Moore will complete a Fishery Management Report by March 2014 which includes the age, sex, and length composition results of the 2013 escapement sampling season. Further escapement information and commercial fishery catch data will be described in the Alaska Peninsula Annual Salmon Management Reports authored by Bob Murphy, Aaron Poetter, Dawn Wilburn, and Nathaniel Nichols and will be completed by April 2014.

The Port Moller AAMB, Dawn Wilburn and the Sand Point AAMB, Nathaniel Nichols, will provide daily weir counts, by species and weir, to Joanne Shaker for entry into the regional escapement database. Regional AMBs are responsible for editing escapement counts by weir and species for accuracy.

FIGURES

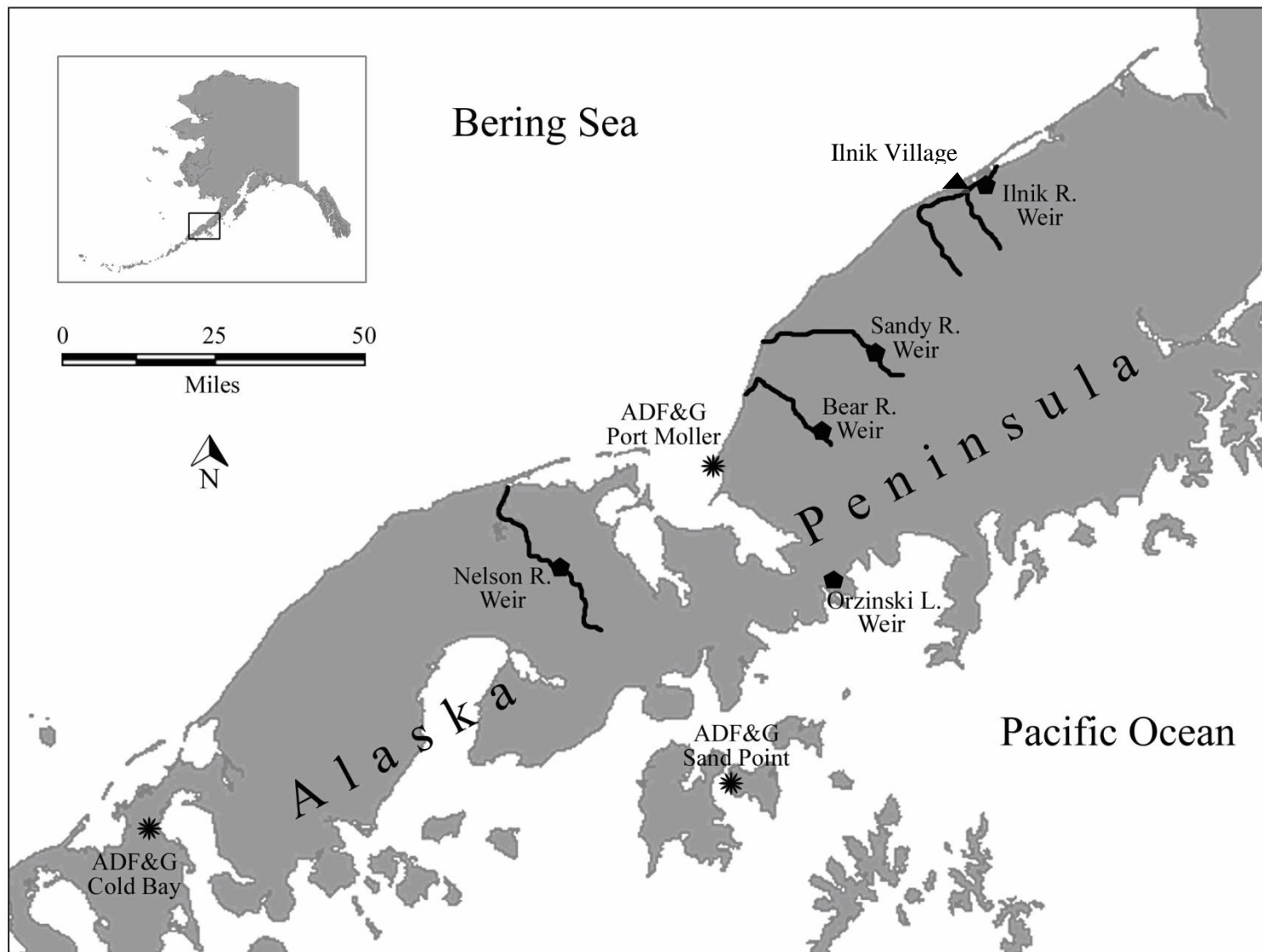


Figure 1.—Map of the Alaska Peninsula ADF&G regional offices and weir locations.

Date: 7/23, 2011		Location: Bear River Weir										Comments: water levels, holes in the weir, weather, etc.
Gate Time		Adult Sockeye		Jack Sockeye		Total Sockeye	Other Salmon					
Opened	Closed	Hourly Count	Daily Cumulative	Hourly Count	Daily Cumulative	Daily Cumulative	Chinook	Pink	Chum	Coho		
750	810	1038	1038	20	20	658	—	3	—	—	1 NM (Net Marker)	
1000	1030	189	827	2	22	849	—	—	—	—	1 NM	
1310	1330	258	1,085	19	41	1,126	—	5	—	—		
SAMPLE	94	1,159	6	47	1,206	—	—	—	—	—	Water 4.75 high	
1630	1700	388	1,547	31	78	1,625	—	9	—	—	3 NM	
1840	1900	263	1,810	9	87	1,897	—	1	—	—	2 NM	
2100	2120	256	2,066	5	92	2,158	—	0	—	—	1 large boat @ weir. Saw w/ cuts right after.	
2245	2310	216	2,282	7	99	2,381	—	0	—	—		
Daily Total		2,282		99	2,381	0	18	0	0			
Previous Day's Total		163,996		1,310	145,306	1	35					
Season Cumulative		146,278		1,409	167,687	1	53	0	0			

Notes: 20-25 mph SW, 300 ft broken ceiling, unlimited gust up to 30 low skies. Average Length = 523 mm

SAMPLED 80 Adults
Male = 40% Jacks = 8%
Female = 52% NM = 1%

Figure 2.—Bear, Nelson, Sandy, and Ilnik rivers, and Orzinski Lake daily and cumulative escapement reporting form.

Follow this procedure when filling out a daily escapement form:

- Begin a new reporting form every day. Each day, copy the season cumulative totals for adults, jacks, sockeye total, and other species over from the previous day's sheet and enter them into the appropriate fields marked "Previous Day's Total" at the page bottom.
- After each count, record the time interval when the fish pass gate was opened under the "Gate Time".
- After each count, add the count from that period (under "Hourly Counts") to the running daily cumulative columns for both sockeye adults and jacks, then total all sockeye and record them under "Total Sockeye Daily Cumulative".
- Record other species counts in the appropriate columns.
- After the last count of the day sum all categories into the "Daily Total" row at the bottom of the sheet. Add the "Daily Total" row to the "Previous Day's Total" row to calculate the season cumulative for that day.
- Enter any notes such as water level, net marks, holes in the weir, etc., into the "comments" field on the right.
- Double-check all computations before reporting numbers to the Area Management Biologist during radio schedules.




**APPENDIX A. PROCEDURES FOR SAMPLING ADULT
SALMON FOR AGE, SEX, AND LENGTH**

Annually, salmon escapements and catches are sampled for age (scales), sex, and length by field crews throughout the State. The database generated is essential for sound management of the State's salmon resources. To be useful, data is recorded using the Meazura MEZ1000 Rugged Digital Assistant (RDA) completely and accurately. In addition, scale samples must be collected and mounted properly to ensure accurate age determination. The following procedures are to be strictly adhered to when sampling adult salmon for age, sex and length.

PROCEDURES

ENTERING DATA INTO THE RDA:

The Meazura RDA is a waterproof Palm Powered™ device that is used to digitally record sampling data. Sample information is transferred from the device to a netbook, and ultimately to a USB flash drive for transport from field camps to the office periodically throughout the season.

To begin using the RDA turn it on by pressing the power button . Using the stylus, tap the home icon in the bottom portion of the screen . This will bring up the main menu. It may be necessary to press the home icon several times to bring up the entire main menu. Next, tap the Forms 5.1 icon . The Pendragon Forms screen will appear. Highlight the sampling form (ASL_X6.48) and then select *New* which is found in the lower left corner of the screen. At this point, the two sampling options are *Enter Background Info* and *Sample Next Fish*.

Background and Sample Next Fish (Fish Data):

Background information (formerly header information on the OPSCAN forms) must be entered at the start of each sampling event (i.e., new day) **or** when any sampling information changes, such as species or lifestage. The sample next fish option is used when continuing to the next fish of a sample where no background information has changed. Sample next fish will immediately allow you to insert fish data, which is associated with the previous background information logged.

Enter each of the following background and fish data into the RDA at the sampling site. Utilize the review screens built into the form software to carefully check accuracy. If a mistake is realized after the review screen, it must be recorded into a logbook for correction upon upload to the netbook.

Entering Background Information:

Species

Select the appropriate species from the drop down list on the RDA (e.g., Sockeye)

Lifestage

Salmon are sampled at various stages of life. Choose the proper lifestage from the dropdown list on the RDA (e.g., Adult).

Project

Indicate the pertinent project from the dropdown list. For example, if sampling adult sockeye escapement at a weir, choose Escapement (Weir, Sonar, Tower, etc.).

Management Area

Choose the relevant management area from the dropdown list. Samples collected from Kodiak Island must have Kodiak selected as the proper management area.

Area Sampled

Select the area that best represents where the fish were sampled (e.g., Ayakulik River).

Location Type

Indicate the type of area in which the fish were sampled. For example, if the fish were sampled at the Upper Station weir, choose Weir. Additional options for location types include lake, river, lagoon, smolt pen, and specific canneries.

Gear

Select the type of gear in which the fish were caught (e.g., Trap).

Type of Length Measurement

Designate the type of length measurement taken. Adult salmon lengths are typically measured from mideye to tail fork, refer to Appendix A3.

Number of Scales per Fish

Fill in the number of scales collected per fish. For sockeye, one scale per fish is collected.

Date of Sample

Escapement sampling: Use appropriate digits for the date the fish are sampled.

Catch sampling: Use the date the fish were caught, even if this differs from the sample date.

Sampler(s)

Enter the last name(s) or initials of each person collecting the sample.

Fish Data:**Scale (Gum) Card Number**

Scale (gum) card(s) are numbered sequentially by date throughout the season starting with 001. A separate numbering sequence will be used for each species, district, and geographic location. Consult your crew leader for the current card number. It is crucial to make sure the number written on the scale (gum) card matches the scale card number entered into the RDA.

Fish Number

The fish number is the number of the fish on that particular scale card. This will be a number between 1 and 40. By default, the fish number in the RDA will automatically advance after each fish is sampled. It will not reset to 1 after 40 fish have been sampled.

Sex

Select the sex of the fish, if unsure choose unknown.

Length in mm

Enter the length of the fish from mid eye to tail fork in millimeters. If for some reason you do not get a length enter 999.

Optional: Select Skip Section if appropriate-

Weight

Indicate the weight of the fish in grams.



Fin Clip

Indicate the type of fin clip observed (e.g., Axillary Process)

Tag Color

Select the appropriate tag color.

Data Entry Notes:

1. When entering text, tap on the dot by the abc icon to bring up a keyboard .
2. To delete a character, place the stylus in the text box and draw a small straight line from right to left. .
3. **Always** double check scale card number and fish number. The RDA does not know how many fish you placed on a card.
4. After background or fish data is entered a review screen appears. Please take the time to confirm data has been entered accurately.

Ensure that all equipment is well kept. Electronics should be stored in a clean safe place. Dry off the RDA with a paper towel after sampling events. The RDA must be **completely** dry before transferring data to the netbook. RDA batteries must be charged to make certain sampling is not hampered. **It is the responsibility of the crew leader to make sure that all data is carefully examined and edited before submitting it to their supervisor.**

SCALE (GUM) CARDS:

Scale (gum) cards for sampling sockeye salmon are shown in Appendix A2. Be sure to fill out the gum cards in pencil as shown in Appendix A2.

Species

Write out completely (e.g., Sockeye).

Locality

Escapement sampling: Include the weir site followed by “escapement” (e.g., Karluk River escapement).

Catch sampling: Include the area(s) where the fish were caught followed by “catch” (e.g., Uganik Bay catch).

Statistical Area Code

Fill in the appropriate digits from the operational plan. If catch samples are from a variety of statistical areas be sure to list each statistical area and approximate percentage from each (if available).

Sampling date

Escapement sampling: Fill in the date the fish were sampled.

Catch sampling: Fill in the date the fish were caught. The sample date, if different from the catch date, may be noted in “remarks”.

Gear

Write out the gear type completely. If catch samples include multiple gear types, be sure to list each gear and approximate percentage from each (if available).

Collector(s)

Record the last name(s) of each person collecting the sample.

Remarks

Record any pertinent information such as the number of scales per fish sampled, processing facility where the sampling took place, vessel/tender name, etc.

SAMPLING PROCEDURE

1. Place the fish on its right side to sample the left side.
2. Determine the sex of the fish and check the M (male), F (female), or Unknown box on the RDA form (Jacks will be entered as males).
3. Measure fish length in millimeters from mid-eye to tail fork (Appendix A3). Record the length directly into the RDA using the stylus. Measure all species of salmon to the nearest millimeter. When collecting length data, take care to ensure that each length corresponds to the appropriate scale mounted on the gum card, as length-at-age is evaluated for each sample.

4. Remove a scale from the “preferred area” on the fish by grasping the scale’s exposed posterior edge with forceps and pulling free (Appendix A4). Remove all slime, grit, and skin from the scale (neoprene wristers work well for this). The preferred area is located on the left side of the fish, approximately two rows above the lateral line on the diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin. If the scales are missing in the preferred area flip the fish over and select a scale within the preferred area on the other side of the fish. If no scales are present in the preferred area on either side of the fish, sample a scale as close to the preferred area as possible. Do not select a scale located on the lateral line.
5. It is important to take care that scales adhere to the gum card, rough side up. Therefore, without turning the forceps over, clean, moisten, and mount the scale on the gum card with your thumb or forefinger. Exert just enough pressure to spread and smooth the scales directly over the number as shown in Appendix A4. The ridges on the sculptured side can be felt with a fingernail or forceps. Mount the scale with the anterior end oriented toward top of gum card. All scales should be correctly oriented on the card in the same direction.
6. Repeat steps 1 through 4 for up to 40 fish on each card.
7. When sampling at weirs you may use “Rite in the Rain”® books to record notes. **Notebooks should be returned to your supervisor at the end of the season.**

SAMPLING CHECKLIST

OPERATIONAL PLAN	PENCILS (NO. 2)
GUM CARDS	FORCEPS
RDA (case and accessories)	PLASTIC CARD HOLDERS
NEOPRENE WRISTERS	CLIPBOARD
MEASURING BOARD	LOG BOOK (Rite-in-the-Rain®)
NETBOOK (and accessories)	USB FLASH DRIVE (in RDA case)

BACKING UP AND DOWNLOADING DATA – TO BE DONE EVERY SAMPLING DAY

After sampling is done for the day, the data must be backed up on the RDA itself and then transferred to the netbook.

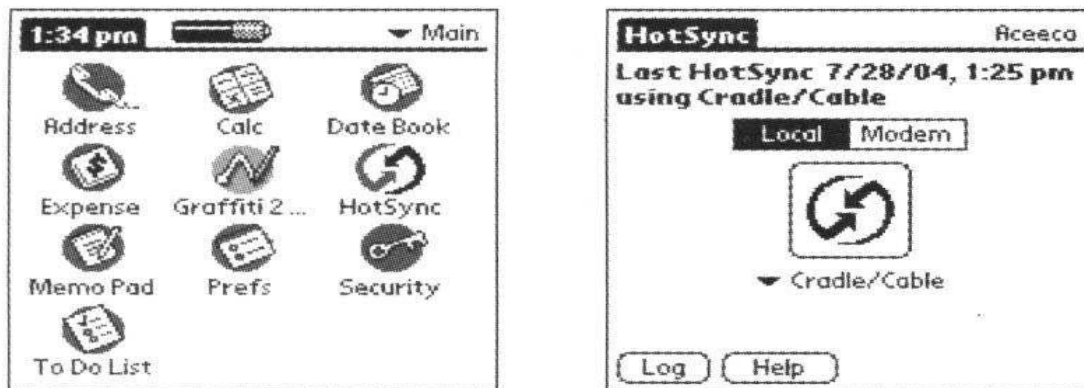
Backing up data:

There are two compact flash drives located in the RDA unit. Each night the RDA should be backed up so that data is stored on both of the compact flash drives. Turn the RDA on, and tap the home icon in the bottom portion of the screen to bring up the main menu. Tap the CardBkup icon, and then the Backup Now button at the top left of the screen. The data will now be on both flash drives.

Downloading Data to Netbook:

The RDA must be COMPLETELY DRY before downloading data from the RDA to the netbook. Connect the communications cable into the RDA and into one of the USB ports on the netbook. Press the power button to turn on the RDA and begin a HotSync by tapping the home icon, and then the HotSync icon found on the main menu. Tapping the large icon in the center of the screen will start the HotSync operation (Figure 1). After the HotSync is complete, the data is on the netbook.

Figure 1: HotSync Screens Found on Meazura RDA



-continued-

Editing, Naming, and Saving Data:

If a mistake is realized during the sample, data should NOT be corrected on the RDA itself. A note should be made, and changes entered only after the data is downloaded onto the netbook. A HotSync operation after changes have been made on the netbook will update the RDA.


To view data open Pendragon Forms Manager (a shortcut should be located to the right of the start menu). Select the form (ASL_X6.48), and click Edit/View under Data Functions on the right side of the window. All data will now be visible. Simply make the necessary changes here and exit out of the window to save. Columns that begin with or have the word “review” in the title should be ignored. A HotSync will update the RDA with the changes you have made on the netbook.

After data has been edited and verified, a copy of the database will need to be saved on the netbook. In Pendragon Forms Manager under Data Functions on the right side of the window click To ASCII. Navigate to the D drive (D:), PendragonForms folder, and then the Data folder found within PendragonForms. Type in the file name and then save. The file name should follow this format: Area_Sampled_YYYYMMDD.csv (e.g., Afognak_River_20100514.csv). After saving, a window will pop up stating the file has been created. Each .csv file will contain all of the data that has been collected up to that point in the season.

TRANSFERRING DATA ONTO USB FLASH DRIVE

Up to date data should be sent into the main office as often as possible (e.g., with the grocery plane). Double click on My Computer, which is found on the desktop. Double click on Local Disk (D:) and then PendragonForms. Double click on the Data folder. The .csv files you have exported from Pendragon Forms Manager should be visible. The title should be formatted to include the area sampled and date (e.g., Afognak_River_20100514.csv). Highlight the most recent file (determined by the date) by single clicking. With the file highlighted, click on edit at the top of the window and then copy. It is important to click on copy, not cut.

Insert a USB flash drive into an appropriate port. Open up My Computer and double click on the USB flash drive (often called “Removable Disk”) found under the heading “Devices with Removable Storage”. Click on edit at the top of the window, and then paste. The .csv file that was copied earlier will appear in the window indicating it was copied to the flash drive. Exit out

of all windows and single click on the safely remove hardware button  on the bottom right corner of the quick start menu. Click on “Safely remove USB Mass Storage Device.” A pop-up will verify that it is now safe to remove the flash drive from the system.

POWERING THE NETBOOK AND RDA

1. The RDA can be charged with either the AC or DC powering options. It is the crew leaders responsibility to keep it charged
2. The netbook can only be charged with the AC power adaptor, therefore plan accordingly for generator use. The charging light on the netbook is red when charging, and green when fully charged.
3. If there are powering problems, please contact the office immediately.

SOME REMINDERS

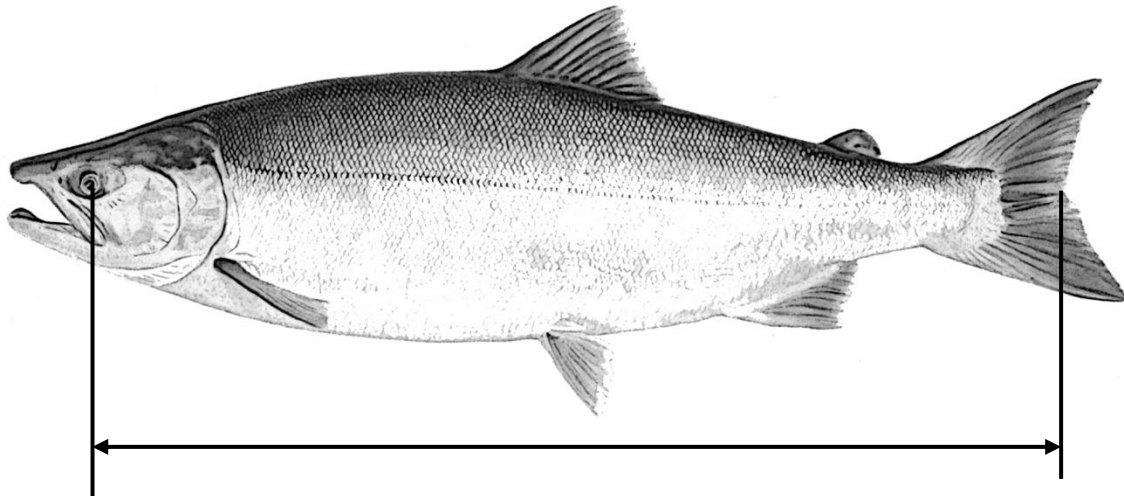
1. Connect the AC adaptor to the bottom of the communications cable to charge the RDA batteries. If using the DC charger, connect the charger into the communications port.
2. **Each length, sex, and scale must correspond to a single fish! It is the responsibility of the crew leader to be sure the data has been entered correctly.**
3. For greater efficiency in scale reading, mount scales with anterior end toward top of gum card (Appendix A4).
4. **Never** put data from different dates onto one gum card, and always enter new background information. Even if only one scale is collected that day, enter new background information and begin a new gum card the next day.
5. Be careful when collecting and mounting scales in wet conditions (rain, high humidity, etc.). If glue dries on top of the scale, it often obscures scale features, resulting in an unreadable scale. In addition, scales frequently adhere poorly to a wet gum card. Protect the cards and keep them dry to avoid having to remount the scales on a new card. If the cards get wet, try to dry them in a protected area or remount if necessary. Remember, use a pencil when filling out gum cards, because ink will come off during pressing.
6. Responsibility for accuracy lies first with the primary data collector(s) and finally with the crew leader. Sloppy or incomplete data or gum cards will be returned to individual collectors for correction.

Appendix A2.—Example of a completed gum card from Bear River.

10	9	8	7	6	5	4	3	2	1
20	19	18	17	16	15	14	13	12	11
30	29	28	27	26	25	24	23	22	21
40	39	38	37	36	35	34	33	32	31

Species: <u>Sockeye</u>	Card No: <u>002</u>
Locality: <u>Bear River</u>	
Stat. Code: <u>315-11-002-055</u>	
Sampling Date: Mo. <u>6</u> Day <u>15</u> Year <u>01</u>	
Gear: <u>Weir Trap</u>	
Collector(s): <u>Plucker - PT Wrestler - AH</u>	
Remarks: _____	

It is important for post-season editing that all information is provided on every gum card. Include such information as who wrestled the fish and who plucked the scale. The gum card should be labeled in pencil. It is the responsibility of the crew leader to make sure all information is entered correctly

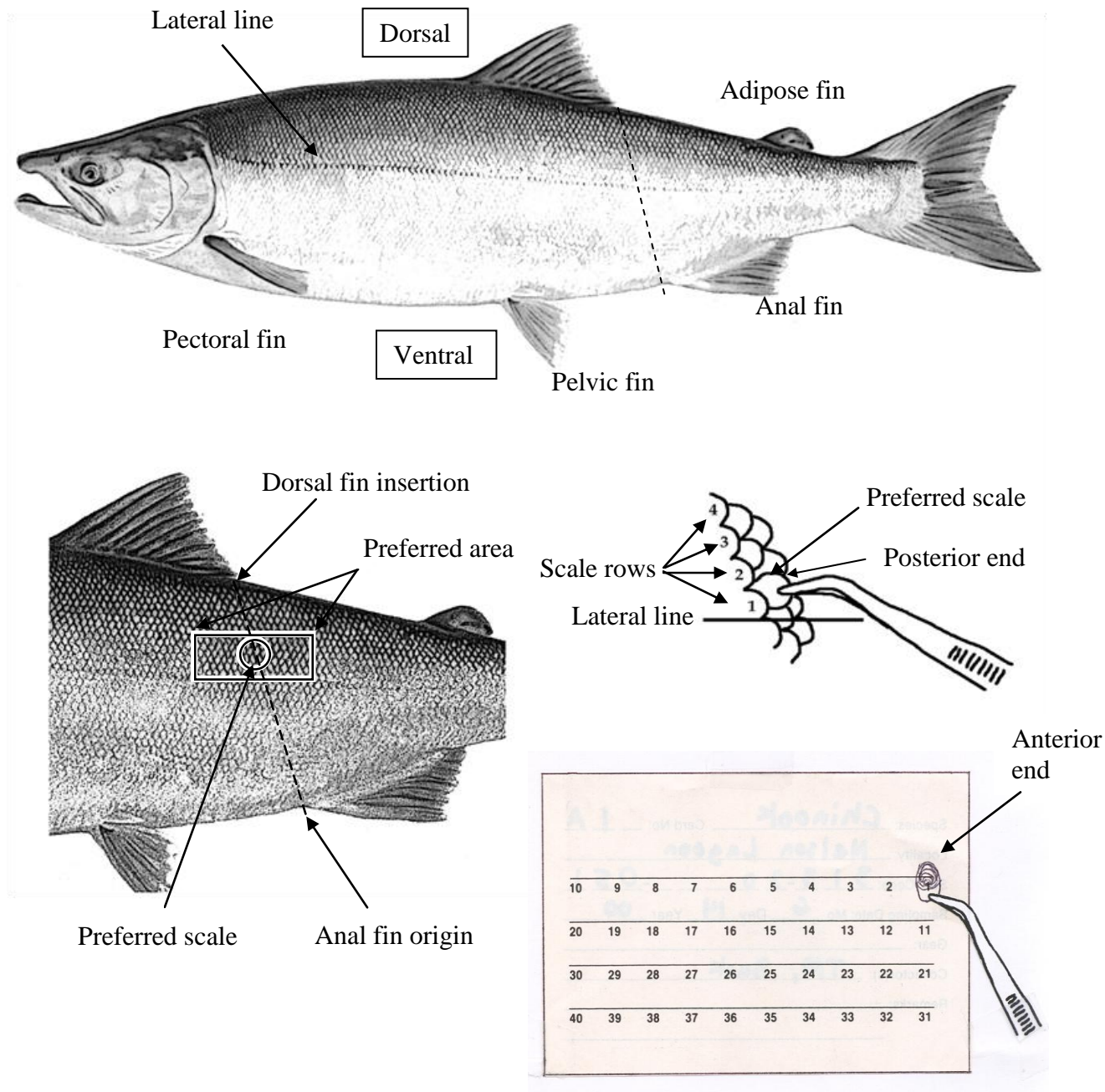


Mid-eye to tail fork

Because the length and shape of the snout of salmon changes as the fish approaches sexual maturity, length measurements are made from the middle of the eye to the fork of the tail. The length is always recorded to the nearest millimeter. The procedure for measuring mid-eye to fork of tail is as follows:

1. Place the salmon flat, right side down, on a board that has a ruler mounted on it with a metric scale. Orient the salmon with its head on your right, the tail in your left hand, and the salmon's dorsal surface (back) towards you. This puts the salmon in the correct orientation for the plucker to remove the preferred scale from the fish's left side if the plucker is standing on the other side of the measuring board.
2. Line the eye of the salmon up with the end of the ruler, then hold the salmon's head with your right hand. Gently sliding your thumb into the salmon's mouth and grasping the lower jaw works well for larger fish.
3. Flatten and spread the tail against the board with your left hand. Read the mid-eye to tail fork length to the nearest millimeter.

Appendix A4.–Preferred scale sampling area on adult salmon.



Do not turn scale over (ridged side should face up, as on fish). Place scales directly over the number on the gum card. Mount scale with anterior portion of scale oriented toward the top of the card, posterior end toward the bottom.

Appendix A5.–Assigned port and weir location codes.

Port Codes

050 King Cove
051 Port Moller
052 Dutch Harbor
053 Akutan
054 Sand Point
057 Canoe Bay

Weir Location Codes

281-50-001-059 Orzinski Lake
313-30-003-056 Nelson River
315-11-002-055 Bear River
315-12-001-060 Sandy River
316-20-001-058 Ilnik River

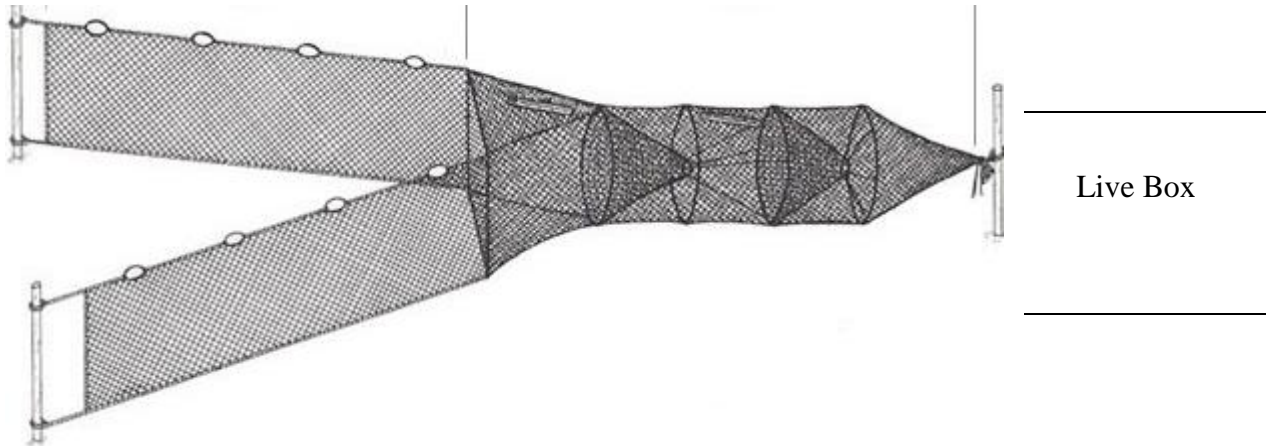
Appendix A6.–Sampling weeks (period) and corresponding calendar dates, 2013.

Sampling week	Calendar Dates
20	10-May to 16-May
21	17-May to 23-May
22	24-May to 30-May
23	31-May to 06-Jun
24	07-Jun to 13-Jun
25	14-Jun to 20-Jun
26	21-Jun to 27-Jun
27	28-Jun to 04-Jul
28	05-Jul to 11-Jul
29	12-Jul to 18-Jul
30	19-Jul to 25-Jul
31	26-Jul to 01-Aug
32	02-Aug to 08-Aug
33	09-Aug to 15-Aug
34	16-Aug to 22-Aug
35	23-Aug to 29-Aug
36	30-Aug to 05-Sep
37	06-Sep to 12-Sep
38	13-Sep to 19-Sep
39	20-Sep to 26-Sep
40	27-Sep to 03-Oct

APPENDIX B. PROCEDURES FOR SAMPLING SALMON SMOLT

SMOLT SAMPLING

A fyke net will be used to trap smolt. Attached to the back of the fyke net is a wooden live box to hold fish for short time periods. The fyke net will be located in relatively swift-moving current, generally near the main channel of the river. The flow must be strong enough to catch fish and provide adequate aeration but not so strong that they get pinned to the mesh. A good procedure is to attach the net behind the weir using the tripods as an anchor for the net.



The wings must be fully extended to obtain maximum coverage. Large rocks can be used to anchor the wings to the river bottom.

The rear live box should be used for short term holding if sampling must be delayed. If too many fish are held in the rear live box they can become stressed, in which case it is possible to have high mortalities. To avoid unnecessary mortality, check the trap frequently. Since the bulk of outmigration occurs a few hours after dusk, night checks may be necessary.

Once the field camp is established, 200 sockeye smolt will be sampled for scales, length, and weight data on a weekly basis during the peak outmigration at Bear River and Sandy River when possible. Smolt sampling will terminate when fewer than 10 smolt are captured over a 24-hour period, and after consulting with your supervisor.

At Bear River, the fyke trap will be fished so sampling can be spread throughout the course of the week to obtain a representative sample. Forty fish taken on five days spread throughout the week will be the goal. The sample can be obtained in a shorter period if it is anticipated that spreading the sampling out over the course of the week may not be possible due to time constraints or physical factors.

At Sandy River, smolt have been sampled in past years, however, due to recent high water years smolt sampling has not taken place. If asked to sample, the sampling goal will be 200 smolt per week if abundance allows. No effort needs to be made to spread the collection of the smolt out over the course of a week. If more than 200 smolt are captured, place the smolt in a large container and gently stir the water to mix the smolt.

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Smolt will be sampled as soon as possible the same day of capture. A smolt sampling day encompasses the 24-hour period between noon of one day to noon of the following day, and is identified by the calendar date corresponding to the first 12-hour period. Age, weight, and length data will be recorded in a Rite-in-the-Rain book at the time of sampling and then using the Meazura MEZ1000 Rugged Digital Assistant (RDA) when sampling is complete.

The smolt will be transported in clean, 5-gallon buckets to the sampling area (at the table inside the cabin). An additional bucket of water will be used as a recovery bucket. Buckets containing smolt will be filled with fresh, clean water and aerated. The buckets will be covered when possible to reduce stress on the fish.

Tricane Methanesulfate (MS-222) will be used to anesthetize the smolt; latex gloves will be worn to prevent direct exposure to the anesthetic. Experienced personnel will demonstrate the use of this chemical. A small amount (approximately 1g) of MS-222 and a small amount of baking soda will be dissolved in approximately 2L of **cold** water. The amount of anesthetic used will vary depending on the amount of water, water temperature, freshness of the chemical, and the size of the smolt. Smolt are extremely sensitive to changes in water temperature so extra care should be taken to prevent the anesthetizing solution from becoming too warm. A digital thermometer and ice cubes can be added to moderate the water temperature and not allow it to exceed 10°C. A few smolt will be placed in the anesthetic solution until subdued to a point where they can no longer flex their axial musculature but can still ventilate their gills. A good way to determine if the smolt are sufficiently subdued is to gently pinch their tail, if they are able to actively swim away they are not ready for sampling. If they are actively ventilating their gills but are not able to swim away, they are ready for sampling. The concentration of the solution should be such that it immobilizes the fish in 2–3 minutes. After the fish are anesthetized, it is important to sample them quickly and place them in a recovery container to prevent mortality. No more than 80 smolt will be anesthetized with one batch of solution.

After the smolt have been immobilized, excess water will be gently removed from the fish using a paper towel or a wet sponge as a blotter. Place the fish on its right side to sample the left side. Measure the length to the nearest mm, from tip-of-snout to tail fork (Appendix B2). Record the length in the Rite-in-the-Rain notebook. Since length-at-age is determined for each sample, take care to ensure that each length measurement corresponds to the appropriate scale smear mounted on the slide. Use a scalpel to remove 4–6 scales from the preferred area (Appendix B3). Mount the scales on a glass slide (Appendix B4). Label the left portion of the slide with slide number, location, species, date (the first day the fyke was set), specimen numbers, and collectors. It is possible to put 10 samples on one scale slide, grouping the scales for fish #'s 1–5 across the top row, and fish #'s 6–10 along the bottom row.

-continued-

The fish will be numbered sequentially beginning with one at the beginning of each new sampling date. For example, slide 001 will have fish 1–10, slide 002 will have fish 11–20, and so on and so forth. This will keep you matched up with the RDA, which you will enter the smolt data into later. Weigh each smolt to the nearest 0.1g, and record the weight in the Rite-in-the-Rain notebook. When measuring weight, care should be taken to avoid excess water clinging to the smolt, which would give an inaccurate value.

Smolt should be kept lightly wet at all times during sampling. Weights will be recorded to the nearest 0.1 gram. Keep all scale slides clean, dry and organized in a scale slide holder that will be provided. Send in scale slides with the optical scan forms to Port Moller throughout the season.

Trouble shooting: What should I do if...

I see high mortalities?

Reduce incoming flow

Open trap during daylight hours, if enough fish are trapped, close at night when peak outmigration occurs.

Check trap more often, possibly just once a few hours after dusk.

Place back stop in the rear live box to reduce flow.

I'm not catching any smolt?

Adjust the position of the fyke to be in the main flow of the river.

Smolt outmigration can peak and trough, you may be in a trough.




The bears are causing damage to the net?

See if enough smolt can be caught throughout the day and close trap at night.

ENTERING DATA INTO THE RDA:

Data obtained while sampling smolt is recorded completely and accurately using the Meazura MEZ1000 Rugged Digital Assistant (RDA). The RDA is a waterproof Palm Powered™ device used to digitally record sampling data. Sample information is transferred from the device to a small computer, also known as a netbook, after each sample. A USB flash drive is used to save and transfer data from the netbooks located in field camps, to the office periodically throughout the season.

Scale samples corresponding to the fish entered into the RDA are collected and mounted properly onto glass slides to ensure accurate age determination (Appendix B4).

To begin using the RDA turn it on by pressing the power button . Using the stylus, tap the home icon in the bottom portion of the screen . This will bring up the main menu. It may be necessary to press the home icon several times to bring up the entire main menu. Next, tap the Forms 5.1 icon . The Pendragon Forms screen will appear. Highlight the sampling form (ASL_X6.48) and then select *New* which is found in the lower left corner of the screen. At this point, the two sampling options are *Enter Background Info* and *Sample Next Fish*.

Enter Background Info

The information entered in this section of the form was formerly the header information on OPSCAN forms. Background information must be entered at the start of each sampling event. A new day always constitutes a new sampling event, so it will be necessary to enter new background information typically once per sampling day. For most projects, changing the background information each day will consist of updating the date only. It is important to edit background information when any change in sampling information occurs. A change in sampling crew, gear, or location would all require an update to the background information. Background information changes correspond with the use of a new glass slide. If information in one of the below categories changes, it is necessary to change the background information. To change the background information, simply click the **Enter Background Info** button.

Species

Select the appropriate species from the drop down list on the RDA, such as **Sockeye**.

Management Area

Choose the relevant management area from the dropdown list. Samples collected from the Alaska Peninsula must have **Peninsula** selected as the proper management area.

Area Sampled

Select the area that best represents where the fish were sampled, such as **Bear River**, from the dropdown list.

Location ID (only entered for some Areas)

Enter the site which the fish being sampled are from. For the Karluk Lake sockeye salmon smolt study, **Site 1** is the main east bank site and **Site 2** is the alternate west bank location.

Location Type

Indicate the type of area in which the **fish were sampled**. For this study, River is generally the best option. Additional options for location types include lake, weir, lagoon, and THA.

Gear Type

Select the type of gear in which the fish were caught, such as **Incline Plane (Fan) Trap** or **Fyke Net**.


Date of Sample

Use appropriate digits for the date the fish are caught, such as 5/27/11.

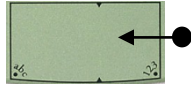
Sampler Initials

Enter the initials of the sampling crew (up to 3 persons). This can be done by writing in the box on the bottom of the screen, or by using the pop up keyboard.

Notes:

1. When entering text, tap on the dot by the abc icon to bring up a keyboard .
2. To delete a character, place the stylus in the text box and draw a small straight line from

right to left.



Sample Next Fish

The **Sample Next Fish** button is used to enter the details of each fish sampled. It is not necessary to click on the **Sample Next Fish** button when entering the first fish of a new sample. After entering the background information, the form automatically knows to go to the sample next fish section of the form. As you continue to sample, simply tap **Sample Next Fish** or **Next** to enter fish data. This option is used when continuing to the next fish of a sample where no background information has changed. Fish data that is entered here is associated with the current background information logged. The following constitute fish data and should be entered for each fish.

Scale Slide (Card) Number

Slides are numbered sequentially by date throughout the season starting with 1. A separate numbering sequence will be used for each species or major location change. Consult your crew leader for the current slide number. It is crucial to make sure the number written on the slide matches the slide (card) number entered into the RDA. The slide number will automatically advance to next number after ten fish have been sampled.

Fish Number

The fish number is a sequential numbering system that begins with the number 1 each sampling event. This allows samplers to keep track of the number of fish sampled each day (or since the background was changed). By default, the fish number in the RDA will automatically advance after each fish is sampled.

Length in mm

Enter the length of the smolt from tip of snout to tail fork in millimeters (i.e., 108). If for some reason you do not collect a length measurement, enter 999.

Weight

Enter the weight of the smolt to the nearest 0.1g, such as 10.2.

Fin Clip and Tag

Select the **Skip Fin Clip and Tag** button if appropriate.

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Optional: Fin Clip

Indicate the type of fin clip (e.g., axillary process) using the drop down menu, then press **Next**.

Optional: Tag ID

Enter the appropriate tag ID.

Select **Sample Next Fish** to continue sampling.

Review

The review button can be a very useful tool during sampling. It can be used to ensure data being entered is accurate, or it can be used for editing fish data during a sample. The review portion of the form displays card number, fish number, weight, and length. The most recently sampled fish appear first. To enter the review screen, tap on the **Review** button on the main screen of the form. After the data has been reviewed and edited tap the **Done** button on the bottom right of the screen to return to the main screen of the form. If **Sample Next Fish** is selected after leaving the review screen, the auto-increment will continue as if the review screen was never entered.

Reviewing Data

To review the last data entered, tap the **Review** button on the main screen of the form. Use the scroll bar on the right side of the screen to look at the fish that have been entered.

Editing Data

If fish data needs to be edited, tap on the individual fish using the stylus. Tap on the **Sample Next Fish** button to go through the fish data that was previously entered for that fish. Changes can be made as needed. Buttons chosen prior to the review are highlighted with asterisks. After a fish has been edited, the main review screen appears. If a fish is accidentally selected from the main review screen, click the button that has the **Card#-Fish#** to return to the main review screen without going through the fish data. As mentioned above, tap **Done** to exit the review portion of the form and return to the main screen.

When sampling is complete, tap **Quit** to exit the form.

BACKING UP AND DOWNLOADING DATA – TO BE DONE DAILY ON SAMPLING DAYS

After sampling is done for the day, the data must be backed up on the RDA itself and then transferred (synched) to the netbook.

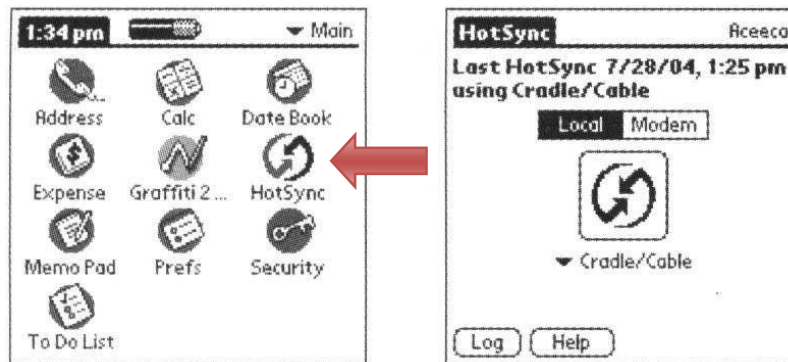
Backing up data:

There are two compact flash drives located inside the RDA. Each night the RDA should be backed up so that data is stored on both of the compact flash drives. Turn the RDA on, and tap the home icon in the bottom portion of the screen to bring up the main menu. Tap the CardBkup icon, and then the **Backup Now** button at the top left of the screen. The data will now be on both flash drives.

Downloading Data to Netbook:

The RDA must be COMPLETELY DRY before downloading (syncing) data from the RDA to the netbook. Connect the communications cable into the RDA and into one of the USB ports on the netbook. Press the power button to turn on the RDA and begin a HotSync by tapping the home icon, and then the HotSync icon found on the main menu. Tapping the large icon in the center of the screen will start the HotSync operation (Figure 1). The HotSync transfers the data to the netbook.

Figure 1: HotSync Screens Found on the RDA



EDITING, NAMING, AND SAVING DATA

If a mistake is realized during the sample it can be changed using the review portion of the form in the RDA. Data can also be changed after it is downloaded onto the netbook, but this is not recommended unless the Kodiak office is consulted first. A HotSync operation after changes have been made on the netbook will update the RDA.


To view data, HotSync the RDA to the computer and open Pendragon Forms Manager (a shortcut should be located to the right of the start menu). Select the form (Smolt_0.22), and click Edit/View under Data Functions on the right side of the window. All data will now be visible. Simply make the necessary minor changes here and exit out of the window to save. A HotSync will update the RDA with the changes you have made on the netbook. The netbook will hold the “master” copy.

After data has been edited and verified, a copy of the database will need to be exported from the Pendragon software and saved on the netbook. In Pendragon Forms Manager under Data Functions on the right side of the window click To ASCII. Navigate to the D drive (D:), PendragonForms folder, and then the Data folder found within PendragonForms. Type in the file name and then save. The file name should follow this format: Area_Sampled_Smolt_YYYYMMDD.csv (e.g., Karluk_River_Smolt_20110527.csv). After saving, a window will pop up stating the file has been created. Each .csv file will contain all of the data that has been collected up to that point in the season.

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TRANSFERRING DATA FROM NETBOOK ONTO USB FLASH DRIVE

Up to date data should be sent into the main office as often as possible (e.g., with the grocery plane). Insert a USB flash drive into an appropriate port on the netbook. Double click on MyComputer, which is found on the desktop of the netbook. Double click on Local Disk (D:) and then PendragonForms. Double click on the Data folder. The .csv files you have exported from Pendragon Forms Manager should be visible. The title should be formatted to include the area sampled and date (e.g., Karluk_River_Smolt_20110527.csv). Highlight the most recent file (determined by the date) by single clicking. With the file highlighted, click on edit at the top of the window and then copy. It is important to click on copy, not cut.

Open up MyComputer and double click on the USB flash drive (often called “Removable Disk”) found under the heading “Devices with Removable Storage”. Click on edit at the top of the window, and then paste. The .csv file that was copied earlier will appear in the window indicating it was copied to the flash drive. Exit out of all windows and single click on the safely remove hardware button  on the bottom right corner of the desktop in the quick start menu. Click on “Safely remove USB Mass Storage Device.” A pop-up will verify that it is now safe to remove the flash drive from the system.

POWERING THE NETBOOK AND RDA

1. The RDA can be charged with either the AC or DC powering options. It is the crew leaders responsibility to keep it charged
2. The netbook can only be charged with the AC power adaptor, therefore plan accordingly for generator use. The charging light on the netbook is red when charging, and green when fully charged.
3. If there are powering problems, please contact the office immediately.
4. Connect the AC adaptor to the bottom of the communications cable to charge the RDA batteries. If using the DC charger, connect the charger into the communications port.

SOME NOTES AND REMINDERS

1. **Each length, weight, and scale must correspond to a single fish! It is the responsibility of the crew leader to be sure the data has been entered correctly.**
2. If a mistake is noticed before moving onto the next fish, the Previous button can be used to make changes in the RDA without having to go to the review screen or alter the data on the netbook.
3. **Never** put data from different dates onto one glass slide, and always enter new background information. Even if only one scale is collected that day, enter new background information and use a new slide.
4. Be careful when collecting and mounting scales in wet conditions (rain, high humidity, etc.). Scales adhere poorly to wet slides.
5. Responsibility for accuracy lies with the primary data collector(s).

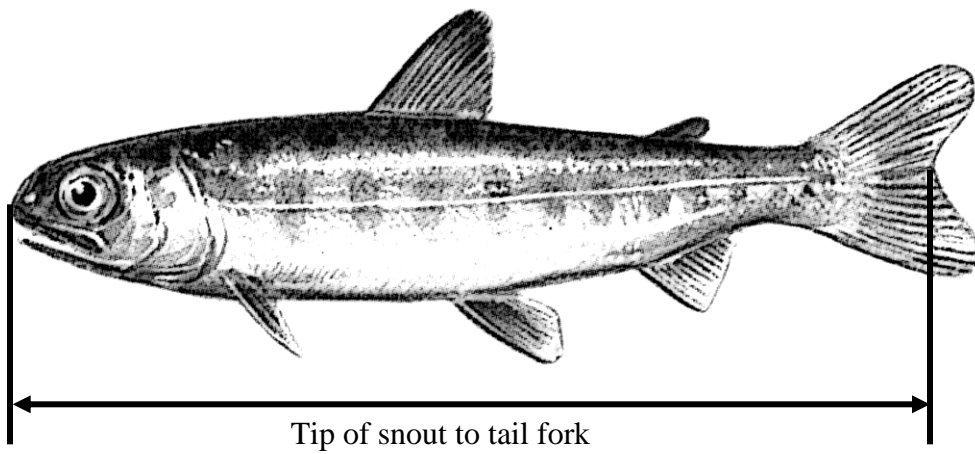
6. Ensure that all equipment is well kept. Electronics should be stored in a clean safe place. Dry off the RDA with a paper towel after sampling events. The RDA must be **completely** dry before transferring data to the netbook. RDA batteries must be charged to make certain sampling is not hampered. **Make sure that all data is carefully examined and edited before returning it to the office.**

TROUBLESHOOTING

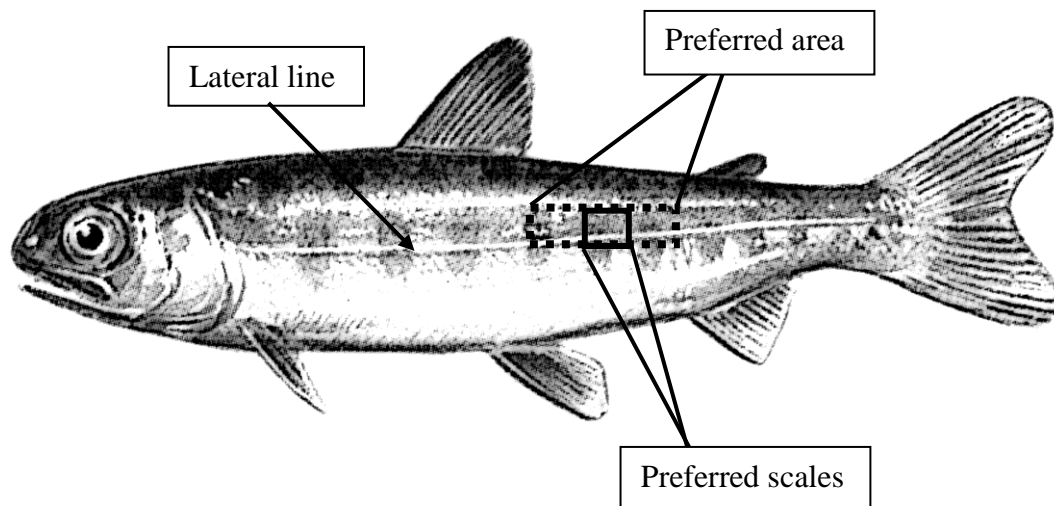
Resetting the RDA

If problems are encountered with the RDA, A soft reset can be done without losing data. To perform a soft reset hold the power and backlight button down together, and release at the same time. If a soft reset does not work, the office should be contacted about other options for resetting HotSync message includes "Exceeded user storage space limit of 500KB in form 'Smolt #.##'

1. Open Pendragon Forms Manager
 2. Under Form Function click on "Properties"
 3. Click on "Advanced Properties"
 4. Click on the "Synchronization Tab"
 5. Change the Storage Limit (KB) to 5000 instead of 500.
 6. Click "OK"
 7. Under "Form Functions", click on "Distribute"
 8. Hotsync the RDA and the Netbook.
-



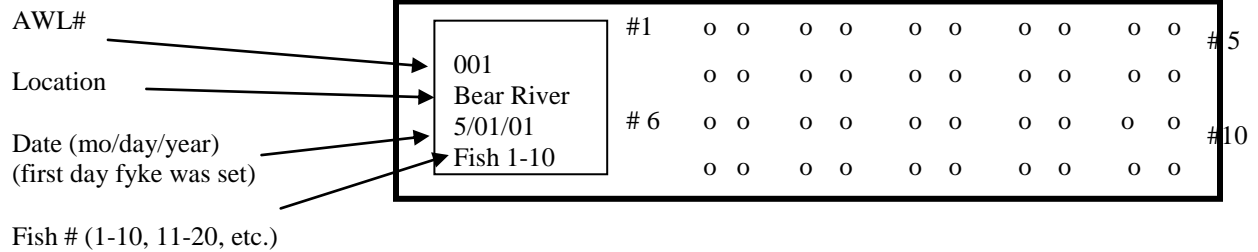
Measure the smolt from the tip of the snout to the tail fork. Lay the smolt on the measuring tape with the snout at the zero mark. Carefully spread the tail with your fingers and note the length inside the fork to the nearest millimeter. It is important to spread the tail, as collapsed caudal rays will give an inaccurately long measurement.



Appendix B4.—Smolt glass slide example.

Information for label:

GLASS MICROSCOPE SLIDE



When the slides are completed, return them to the box in order by optical scan form number, date, and fish number. Label the slide box on top with the following information:

Location (e.g. Bear River)

Beginning and ending dates (e.g. 5/01/01 – 5/15/01)

APPENDIX C. GENERAL EQUIPMENT, CAMP MAINTENANCE, AND CAMP POLICY

EQUIPMENT MAINTENANCE

Equipment maintenance is one of the most important operations you will perform during the field season. The outboard motors, generators, and other equipment must be kept in good operating condition.

It will be the crew leader's responsibility to assign the most knowledgeable member of the crew to the job of maintaining and servicing the equipment. It will be this person's responsibility to see that all equipment is kept in operating condition.

ENGINE CARE AND OUTBOARD OPERATION

If an outboard uses mixed fuel, the correct outboard motor fuel mixture is 50:1. The newer Precision Blend outboards mix the two-cycle oil and gas automatically, but older engines will need to have their fuels pre-mixed. Always pour the oil into the tank first, then add 2 or 3 gallons of gas and mix thoroughly, then fill tank to capacity always using a large funnel and chamois filter. Some outboards may be four-stroke engines, which need to have oil level checked routinely. Always mix fuel tanks or equipment under cover to prevent water contamination and always use a funnel and filter. Note that chainsaws have a fuel mixture of 25:1. Chainsaw gas should be mixed in a separate can and clearly marked that it is chainsaw fuel to avoid accidentally being used in outboards.

Always place outboard motors in neutral when starting and always make sure a safety line is attached between the boat and motor. Perform a check daily of the clamp screws that hold the outboard to the transom. Also routinely check the motor for loose screws and bolts, cracks, and breaks, especially in the area of the lower unit. Never start or run an outboard in the tilted position.

In the normal operation of an outboard, a stream of water is discharged from a hole in the bottom edge of the cowling or from the back of the shaft. If this stream of water stops, the water pump may not be working and the motor should be shut off. On propeller outboards, the side plate over the water intake can be removed for cleaning as it may be plugged. If the pump continues not to function, the outboard should not be run, and a report to base camp should be made. On jet units, a cover on the side of the cylinder head through which water circulates can be removed and cleaned, and the cover over the temperature sensor (thermostat) can also be cleaned to restore flow. Take along a piece of bailing wire to dislodge sand from the small water discharge tube under the cowling.

Check the gear oil in the lower unit of the outboard once a week and drain and replace the gear oil at the end of the season and every 50 hours of operation. Jet units must be greased daily. This is crucial. Grease guns will be provided.

If the skeg or jet unit hits bottom, check the screws to make sure they are still secure and there is no damage to the lower unit. Also, remove any rocks stuck between the grates on the jet unit.

All outboards are to be tilted in the up position when moored to preclude silt accumulation in the jet unit or water pump and skeg or housing damage.

If your outboard will not start, check the following:

- Check to make sure the kill switch is clipped to the engine properly.
- Check to see if the fuel line is connected properly to the motor and the tank and not pinched or kinked, and that the air vent on the tank is open.
- Check to see if there is water in the gasoline.
- If the engine is flooded, wait 5 minutes for the plugs to dry before attempting to start again.
- Check the spark plugs and spark plug wires as they may be fouled or defective (replace if needed).

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BOATS

Boats are to be kept clean and free of loose tools and debris, and moored at locations where they are not subject to damage by wave action or through contact with the river bottom in rock laden areas. Boats must be bailed regularly of rainwater to keep them from sinking.

Each crew leader will be responsible for maintaining mooring stakes on the river bank sufficient for the boats assigned to his project plus one transient craft. Further responsibility includes maintaining a bow line on each assigned craft and ensuring that each boat is properly moored at the end of each work day to preclude possible loss or damage.

GENERATORS

Portable generators may be supplied to field camps. Their maintenance is important. Since most of the generators have 4-cycle engines, mixed gas must not be used. The crankcase oil reservoir should be checked daily and maintained at the full level. At the end of the season, and after 25 hours of operation, the oil should be changed. Spark plugs should be checked at every oil change for fouling and gap.

CAMP MAINTENANCE

Maintaining a clean and efficient field camp is required. Maintenance of living accommodations and other installations will be performed as necessary. All materials necessary will be provided.

Grounds will be kept free of litter. All garbage will be bagged up and disposed of at the nearest sanitary landfill at least once a week. Special precautions should be observed to ensure that garbage does not attract bears and other scavenger species.

Upon completion of the summer season, all camp equipment will be cleaned prior to winter storage. All sampling nets, tarps and cloth items must be dry before being stored. All skiffs and ATVs will be chained and locked to a stationary object at the end of the season.

The crew leader at the close of the field season will take a complete equipment inventory. A report detailing the equipment and storage locations will be submitted at the end of the season to the supervisor. A list of equipment needing replacement or repair will also be submitted, along with an equipment need list for next season.

CAMP POLICY

No alcoholic beverages are to be stored in areas open to public view. If alcohol is consumed at a camp an employee must be off-duty and under no circumstances shall he or she engage in the operation of any State equipment or firearms. Employees will not return to duty status under the influence of alcohol.

The crew leader of each camp shall establish a policy on living standards and personnel behavior in accordance with State guidelines. Time off for individual crew members must be scheduled by the supervisor. All employees will be required to act in a professional manner at all times and shall be especially courteous to the public.

It will be the responsibility of the crew leader to prevent any abuse of State equipment. The crew leader will report within 24 hours to the supervisor any damaged or lost equipment.

All employees, unless approved by the supervisor, are expected to remain at the camp they are assigned and are not permitted to leave the location.

FOOD ORDERS

Grocery orders should be placed during the evening radio schedule beginning at 7:20 PM. For Nelson, Bear, Sandy, and Ilnik Rivers, the order should be placed with Port Moller, and for Orzinski Lake the order is placed with Sand Point.

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PERSONAL GEAR AND PETS

Generally 100 lbs. is a maximum limit for personal gear. Check with your supervisor first if you anticipate bringing more than that amount to your field camp. Pets are not permitted in remote field camps. Pack in small bags and containers that will easily fit into small aircraft doors.

RADIO OR SATELLITE PHONE SCHEDULES

Radio or satellite phone schedules are used to pass on pertinent information to/from the field offices. It is expected that all employees will participate in these schedules or that if an employee is not available that the crew leader will pass on pertinent information to the employee. Radio or satellite phone schedules will be made twice daily. For Port Moller field camps, schedules are normally at 8:20 AM and 7:20 PM on the satellite phones or on the single side band on 3.230 megahertz. The morning schedule is used for passing along the current weather (visibility, ceiling, wind speed and direction, precipitation, etc.) and the previous day's escapement counts. The evening schedule is used for updated escapement counts, grocery, and supply orders, and the latest pertinent fishery announcements. All camps must complete the schedule within 15 minutes in the morning and 30 minutes in the evening, so we do not invade another areas time allotment. So, keep the conversation short. Personal conversation between camps should be arranged at times as not to interfere with any ADF&G schedules and be kept to a minimum. Where satellite phones are being used, a schedule will be worked out with the appropriate supervisory office. Personal use of satellite phones will be limited to a specific time that will not interfere with any radio schedules, and only be allowed if there is no cost to the state. Emergency contact phone numbers should be clearly displayed on/near the phone.

If a camp does not respond to two consecutive radio/phone schedules, the worst will be assumed and a plane will be dispatched. If for some reason you know that you will not be able to make a radio schedule, notify beforehand either Sand Point or Port Moller. If you miss a morning radio schedule without prior arrangement from your supervisor, you must immediately contact your supervisor to pass on pertinent escapement numbers since these numbers are used for management of the fishery as well as passed on to other locations. In an emergency, the Coast Guard can also be summoned using frequency 4.125 MHz by saying "Mayday, Mayday, Mayday" and give your name, say who you work for, your location (field camp name on the Alaska Peninsula and approximate distance from a town, i.e. 10 miles east of Port Moller for Bear Lake or lat. /longs. if known), and the nature of the injury or emergency. Always broadcast even if you think nobody hears you. Somebody may be listening to the radio somewhere and can pass on your emergency to the appropriate people. All personnel need to be familiar with the single sideband/phone and the operation to contact the appropriate emergency personnel. A list of sideband frequencies and phone numbers should be readily available (taped to the radio/phone) if an emergency exists. If 4.125 MHz on the single side band radio is not marked on the radio and you need assistance finding which dial number it is located on, please ask the appropriate supervisor. Listed below is the latitude and longitude of some field camps. These lat. /longs. should be written on the radio or be readily accessible in an emergency.

Orzinski Lake, ADF&G cabin	55°43.783' N. lat., 160°05.700' W. long.
Nelson River ADF&G cabin	55°48.990' N. lat., 161°14.047' W. long.
Bear River ADF&G cabin	56°02.242' N. lat., 160°16.098' W. long.
Sandy River ADF&G cabin	56°11.941' N. lat., 160°01.529' W. long.
Ilnik River ADF&G cabin	56°36.729' N. lat., 159°34.282' W. long.
Port Moller Airstrip	56°00.331' N. lat., 160°33.665' W. long.

Any employees performing job duties away from the cabins (such as boating trips up/downriver) or hiking/fishing/etc. on their own time are required to let others know their plans such as where they are going and when they are expected to return. Also, in each camp is a handheld VHF radio (with spare batteries), backpack with basic survival gear, Emergency Position Indicating Radio Beacon (EPIRB), and firearm and ammunition which the employee is encouraged to carry for their own safety. All field camps will standby on channel 72 for North Peninsula locations and channel 6 for Orzinski Lake, as do local pilots and commercial fishermen. All employees should be aware of the gear in the back pack and should request additional safety/survival items if needed or missing. Employees with any questions or concerns are asked to pass them on to their supervisor.

FISH AND WILDLIFE VIOLATIONS

This is not intended as an inclusive procedure for handling violations. Below are guidelines for obtaining the necessary information and/or evidence to document a violation. It is important to be familiar with the commercial fishing, subsistence fishing, sport fishing, and hunting regulations in your area. Violation reporting procedures are printed on the back cover of the commercial fishing regulation book. Request the regulation book if your camp does not have one.

The use of the “4 W’s” can greatly aid the Alaska Wildlife Troopers (AWT) in obtaining sufficient evidence for a case.

- What is the violation?
- When did the violation occur (e.g. date, time, tide condition, etc.)
- Where did the violation occur?
- Who is in violation and who are witnesses?

It is important that specifics about the event be documented so the appropriate officer can follow-up and contact those involved. If you have a camera available, pictures are extremely valuable in prosecuting offenders. Collect as much information as possible and contact your supervisor or a State Trooper from AWT immediately. If you do not feel comfortable, or your personal safety may be in danger, do not pursue the violation. Contact your supervisor and they will handle the situation. Be aware that you do not have the power to arrest somebody or seize equipment. Just limit yourself to documenting the event as safely as possible.

FIREARMS

A State weapon will be provided at each camp. If you are unfamiliar with the operation and use of a firearm, please let your supervisor know. Training will be provided for anyone who requests it or is unfamiliar with firearms. Loaded guns are prohibited inside the camp facilities. Anyone handling a firearm should always treat it as if it were loaded. Guns should be kept clean and oiled and be completely unloaded while being cleaned. Any horseplay or misuse of firearms while working for the Department of Fish and Game will not be tolerated and may be grounds for immediate dismissal. Completely unload a firearm of all rounds before entering a vessel, airplane, or four wheeler.

BEARS

Do not encourage bears to come around camp by leaving food or unburned garbage around. Do not shoot at a bear unless, in your best judgment, it is endangering someone's life or damaging personal or state property. Use your best judgment on whether to shoot a bear if property is at stake. When trying to frighten a bear away by shooting, do not fire toward it. You may wound it by pulling the shot, ricochets, etc. Do not use cracker shells at close distance (<30'). If a cracker shell hits a bear at close range, it may penetrate the body cavity and explode inside the bear, killing it. If you are having problems with a particular bear around camp, call the appropriate supervisory office and notify them of the situation. The Division of Wildlife Conservation personnel may take care of the problem.

GARBAGE

Burn garbage as needed to prevent bear problems (e.g. food products). A burn barrel should be used to ensure that any bear attractants are completely incinerated. If a burn barrel is not available make sure the fire burns hot enough to incinerate food. Flatten metal cans and box them for empty return flights. Be sure all burn barrels have proper grates or covers to prevent grass fires from sparks. Never leave a fire unattended and always have adequate fire extinguishing materials handy.

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TRANSPORTATION

Do not endanger life or property by going out in a boat on dangerously rough water. If you are unfamiliar with marine safety, ask one of the field offices for information or advice. All personnel must wear a Coast Guard approved life jacket when out on any water. Be conservative and use good judgment: if you think it is dangerous, don't go out on the water.

Extra shear pins or propellers, and a tool kit which includes pliers, spark plugs, and a spark plug wrench, should be in the boat at all times. Also, a handheld Very High Frequency Radio (VHF) and/or flares should be carried. In case travel at night becomes necessary, carry a flashlight.

Some camps may be furnished with 4-wheel all terrain vehicles (ATV). The following safety precautions shall be observed at all times regarding Department ATV operation. Follow all safety rules listed on the vehicle and in the safety manual provided by the manufacturer. If the manual is unavailable, contact your supervisor, as they will have a copy that could be sent to you. A safety helmet is provided. An ATV may provide transport of State materials, supplies, and equipment between camp sites and supply planes or vessels. In addition, they may be used for transportation to and from assigned duties in the field such as monitoring a fishery or collecting harvest information, etc.

Review the Marine Safety and Light Aircraft Safety Manuals located at all camps before boating or flying. Do not get in a boat or plane if you feel uncomfortable with the situation. Consult the crew leader or pilot beforehand.

FIRE AND FIRST AID

All remote employees are required to have up to date First Aid and CPR certificates. Make an effort to avoid intestinal parasites such as *Giardia*. When in doubt, boil your drinking water for 15 minutes.

Check your camp's fire extinguisher. Know where it is and how to use it! Inventory your camp first aid kit, replace items as needed and become familiar with basic first aid treatment. Review the first aid booklet.

Keep the cabin, surrounding area, and yourself clean and neat. Appearance is important. You will not always be notified of the intended arrival of visitors, officials, etc. Visitor impressions are often based on your appearance.

COMPATIBILITY OF FIELD PERSONNEL

Field work involves close contact with few people for extended periods of time. Every effort should be made to get along well and maintain positive relationships with co-workers. Employees should make genuine efforts to be cleaner, more courteous, and forgiving of their co-workers than would be necessary in normal 9AM–5PM working conditions. A genuine effort should be made to resolve any disagreements that arise. If your camp mates are doing something that irritates you, talk to them about it politely, chances are they are unaware that they are causing a problem for you. If you find yourself absolutely unable to get along with other members at your camp despite your best efforts, notify your supervisor and an attempt will be made to resolve the situation.

MEMORANDUM

State of Alaska

Department of Fish and Game
Office of the Commissioner

To: 2013 Escapement Sampling Crews

From: Bob Murphy and Dawn Wilburn
Area Management Biologists
Division of Commercial Fisheries
Department of Fish & Game - Kodiak, Port Moller

SUBJECT: Health and Welfare of Crew Members

All employees must read the Safety Standard Operational Plans and included safety materials and must be fully aware of all health and safety practices (e.g. basic first aid, location of fire extinguishers, etc.). With camps, as remote as they are, do not neglect proper health and safety practices. There can be serious ramifications if an employee were to become ill.

Sand Point, Port Moller, and King Cove have medical clinics. Insurance forms will be available at all locations. Inform your supervisor immediately of any illness or injury that will require medical assistance or lost work time. Report all injuries to your supervisor immediately.

A State firearm may be available at each location. Loaded guns are prohibited inside any facility. Anyone handling a firearm should always treat it as if it were loaded. Guns should be kept clean and oiled and be completely unloaded while being cleaned. Any horseplay or misuse of firearms while working for the Department of Fish and Game will not be tolerated and will be grounds for immediate dismissal. Completely unload a firearm of all rounds before entering a vessel or airplane. If you are unfamiliar with firearms, please notify me immediately and proper safety and handling instructions will be given.

Do not antagonize bears, each one is a potential danger. Do not encourage bears to come around camp by leaving food or unburned garbage around. Do not shoot at a bear unless, in your best judgment, he is endangering someone's life or damaging valuable personal or state property. Use your best judgment on whether to shoot a bear if property is at stake. Be careful when, and if, trying to frighten a bear away by shooting near it. By chance, you may wound the animal accidentally. If you are having repeated problems with a particular bear around camp, call the AMB and notify them of the situation.

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Port Moller, Sand Point, and Ilnik and Sandy Rivers have 4-wheel all terrain vehicles (ATV). The following safety precautions shall be observed at all times regarding department ATV use. A safety helmet will be provided during operation of an ATV. An ATV will provide transport of State materials, supplies, and equipment between camp sites and supply planes or vessels. In addition, they may be used for transportation to and from assigned duties in the field such as monitoring a fishery or collecting harvest information, etc. Recreational activities within reason are permitted but safety of the rider and vehicle must be observed.

Check your camp's fire extinguisher. Know where it is and how to use it! Check carbon monoxide and smoke detectors to make sure they are in working conditions with a new installed battery. Inventory your camp first aid kit, replace items as needed and become familiar with basic first aid treatment. Review the first aid booklet.

Keep the cabin, surrounding area, and yourself clean and neat. Appearance is important. You will not always be notified of the intended arrival of visitors, officials, etc. Impressions of visitors are often based on appearance. Personal hygiene is very important in field camps or remote sites since everyone lives in close proximity to each other. Always wash hands after using the restroom and prior to food preparation.

Rabies is common on the Alaska Peninsula, so be careful of all mammals including ground squirrels, fox, wolf, otters, and your pet. If bitten save the head of the animal if possible, wrap the head in several layers of plastic, put in a good box and freeze if possible. Notify your supervisor of the accident immediately. Burn and bury remaining parts of the carcass away from water sources and cabins, take precautions such as wearing plastic gloves to dispose of the carcass. Do not send suspected rabies animals out of your area unless you are bitten.

**APPENDIX D. BEAR, NELSON, SANDY, AND ILNIK
RIVERS, AND ORZINSKI LAKE WEIR INSTALLATION
PROCEDURES**

BEAR RIVER WEIR INSTALLATION

MATERIALS

All weir installation materials are stacked on the bank of the river at the installation location. The materials are divided roughly in half on either bank. You will need the following items to install the weir and do repairs on the tripods:

- Claw (framing) hammer
- 2–3lb hand sledge
- Hand saw
- Wire cutters
- Vise-grips
- 16 penny nails (for attaching sandbag platform boards and catwalk boards)
- 20 penny nails (for stringer supports)
- Dock spikes (for reinforcing main tripod timbers)
- A number of 2x4's (for tripod sandbag platform)
- Bailing wire or long, strong zip-ties

LOCATION SELECTION

Weir location selection is critical to subsequent ease of weir maintenance, access, and safety. The weir should be installed roughly in the same location as the previous year. The riverbed should be thoroughly profiled by walking across the river a number of times to determine where any holes, gravel bars, or channels exist which could cause problems with alignment or installation. Choose a transect which offers the smoothest, best consolidated, and most continuously regular substrate possible. Keep in mind that the weir should run roughly perpendicular to the river's current in the deepest, fastest channel. Place a stake or sandbag on each bank at either end of the chosen transect so that you have a target to work towards and a fixed reference point to sight-off of to check tripod alignment.

The Bear River camp sits in close proximity to Bear Lake Lodge. Often lodge employees run river boats downstream so an agreement should be made with lodge personnel prior to installing the weir. To prevent having to take out sections of the weir later on, ask the lodge if they want to put their skiffs below the weir before it gets installed. A boat gate was built in 2008 to allow for skiffs to pass without interruption or assistance from ADF&G crew, however, it wasn't "bear proof" and fish escaped without notice.

Bear River water levels are generally low in spring when the weir is installed, but can be expected to rise significantly (two feet and more) over the course of the summer. In some years, two distinct peaks in water level can be observed which correspond roughly with the peaks in the salmon runs. The water can rise as much as two feet in 24 hours, usually as a result of heavy rains, warm weather melting snow and glaciers, and high winds off the lake, so be prepared for the worst early in the season. During high water events extra care must be taken to clean and maintain the weir. It is better to spend a few extra hours a day cleaning the weir than it is to spend a few extra days reinstalling a washed out weir.

TRIPOD PLACEMENT

The weir generally uses 20 to 23 tripods, so you may end up with one or two spare. Begin on either side, but it is important to use the older, weaker tripods where the current is slack. Check the 20 penny nails in the front leg of the tripod where the stringers will rest before placing them in the water as it is hard to drive new ones in place when the leg is underwater. When rolling the tripods to the river, make every attempt to be gentle so that the timbers do not split or part, and that the nails on the front leg are not bent. Place the tripods so that the back legs have about 4 inches of gap between them (the width of your foot) and mount stringers on the front leg as you work. Make sure there is 4–8 inches of overlap on either end of the stringer where it meets the tripods. Adjust the spacing of the tripods to maintain adequate stringer overlap. Allow more overlap where the current is stronger and the water is deeper. This will allow some tripod settling and traveling without the stringers being pulled off the front leg.

As you work, check the alignment by sighting down the stringers towards the target stake or sandbag on the far bank. The tripods placed in deeper water may require some sandbags to keep them from moving in the current. Once you have found the correct position for the tripod, push it back and forth forcefully to work the legs down into the gravel and set them in place. This will help minimize movement later. Recheck alignment periodically. Proper alignment of the tripods is critical to having the panels lay flat on the stringers and prevent gaps between panels later. A little extra care and effort at this stage can save countless hours of weir maintenance later in the season when the water level rises. A weir that is not completely straight will collect concentrated debris in crooked areas, increasing that chance that the weir will wash out due to debris load.

Once the tripods are set and the stringers are on, spend some time loading the platforms with sandbags as the resistance will increase dramatically once the weir panels are put on. The tripods in the shallow, slow moving water near the banks may need as few as six sandbags each, while the deeper tripods may require 40 or more. If you begin installing the weir late in the afternoon, this is a good place to stop for the day to allow the tripods to settle down into the substrate overnight before adding the resistance of the panels. This additional resistance can cause the tripods to settle back as well as down, negating much of the effort devoted to alignment.

Keep in mind that the weir generally fails due to sandbags being washed off the tripod platforms, so sandbag placement is critical to surviving episodes of high water. The sandbags should be wedged between the tripod legs as tightly as possible. Eventually, additional sandbags can be stacked on the wings behind the back legs, and a small platform can be added to the crown of the tripod for additional bags. Nail one or two planks across the back of the rear legs above the wing support to keep sandbags from washing off the back of the platform once it is loaded.

PANEL INSTALLATION

Place the panels on the weir starting on one end making sure that the panels are perfectly perpendicular to the water surface. You will likely have to dig into the substrate to allow the entire bottom of the panel to rest in the gravel as you descend the banks or move past irregularities in the gravel. Hop up and down on the t-angle crosspiece of the panels to push the panel down into the gravel. As you go, do not forget to install the three gates at intervals that cover different water depths. Two gates will be used as fish passes, and one will lead into the sampling trap. As the water level and turbidity rise, you may need to switch to a fish pass gate in shallower water, so install the gates leaving yourself some future options (such as one in the deepest channel, and another closer to the bank). Think about where you want the trap and install a gate for this purpose as well.

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Finally, put the catwalk boards on and use them for shuttling more sandbags onto the weir. All boards should overlap on a tripod wing. If necessary, blocks can be nailed to the tripod wings if the catwalk board does not meet the wing properly.

Line the entire front of the weir with sandbags to prevent scouring below the panels. Later, in August, pinks will accumulate in front of the weir to spawn. While digging their redds (nests), they throw prodigious quantities of gravel up on the front of the weir, which becomes a maintenance concern on the weir. Bears will swim back and forth in front of the weir, also throwing gravel up on the panels. Laying weir panels flat on the river bottom in front of the weir helps keep the rocks from being kicked up. Lay the panels parallel to the weir and hold them down with a few sandbags.

Zip-ties can be used to attach the panels to the stringers and join panels where they meet in order to keep the panels from shifting and make it more difficult for bears to knock the panels free. Another method of keeping bears from opening holes in the ends of the weir is to stack numerous panels against the weir. The bears typically will pull one or two free, but then lose interest.

TRAP ASSEMBLY

To assemble the fish trap, you will need:

- 3 full-sized weir panels
- 2 panels which have been cut off at an angle on one end
- 3 half-panels (cut lengthwise)
- 6 fence posts
- 2–3 lb hand maul or post-pounder
- Bailing wire or long, strong zip-ties
- Wire cutters
- Vice-grips

The trap is most effective if it is installed offset to one side of the fish gate so that you can run the sampling net up a weir panel and not leave any gap through which the fish can escape past the net. Begin by laying a full sized panel on its side pointing upstream, letting the downstream end rest against the base of the weir next to one side of the fish gate. Pound two fence post in at both ends and wire the panel to the posts to hold it. Measure the distance between the top and bottom t-angle cross pieces of a panel. Measure out this distance across the face of the weir and put another full sized panel parallel to the other panel that was just put in. Pound two more fence posts in and wire the panel to them for support. Next, stand well upstream of the open end of the trap with the last full sized panel. Holding the panel vertically on its side and parallel to the weir, in one movement sink the panel down into the water and walk forward with it as the current moves it downstream until it rest against the two existing panels jutting out from the face of the weir. You should now have a mostly enclosed box sitting in front of the gate. The gaps at the downstream ends of the side panels of the trap can be closed using the diagonally cut panels. Put the cut panels on the inside of the side panels with the cut ends resting on the river bottom and the short side resting against the face of the weir. Secure everything in place using bailing wire. Add more fence posts to reinforce the structure as needed. The three lengthwise half panels are available to make the sides of the trap taller if the water should rise, and to put the measuring table at a comfortable working height.

MAINTENANCE

The weir needs to be cleaned thoroughly at least once a day. A dry suit and snorkel mask will be needed for this task in order to clean and inspect the foot of the weir panels. During high water events the weir may need to be cleaned more than once a day. Consistent and thorough weir maintenance prevents major problems from forming.

Holes should be patched using sandbags or extra panels if the hole is big enough to warrant. Generally if two fingers can fit easily through a hole, a salmon can squeeze through, holes larger than two fingers should be patched.

REMOVAL

Starting at the far end of the river, remove the sandbags from the foot of the weir, followed by panels, stringers, and eventually the sandbags weighing the tripods down. Be sure to leave enough sandbags on the tripod to keep it from floating away. The boat can be used to ferry these items back to shore to be stacked neatly. Take care not to overload the boat. The tripods should be arranged neatly for easy access during the start of the next season. All items should be stored away from the river bank, as spring flooding and ice may easily carry weir materials downriver if left on the river bank.

Once all materials are out of the river and stacked neatly they must be secured. Rope should be used to tightly bind all the tripods together, preventing bears from separating them, and preventing flood events from carrying single tripods away. The panels should be tied down either with ground line or bailing wire.

NELSON RIVER WEIR INSTALLATION

MATERIALS

- Vice grips, at least 4
- Sledge hammer
- Impact mallet
- Bailing wire
- Zip ties
- Rope
- Buoys
- Fid
- A Panels
- B Panels
- Chain link fencing
- Wire cutters
- J hooks
- Rebar

PREINSTALLATION INSPECTION

Upon arriving at the Nelson (Sapsuk) River field camp, inspect the over-wintering condition of the following weir components and relay the condition of them to the Port Moller ADF&G office at the next radio schedule.

- The rail
- The south bank stabilization structures
- The winch stanchion and north bank deck
- The weir trap and funnel (located on the south bank)
- The weir panel piles (There should be piles on the north bank and on the south bank)
- The Beebe winch
- The chain link fencing on either side of the rail

The rail should be embedded, straight, and roughly perpendicular to the stream banks. Some or all of it may be covered with gravel deposited during the winter. Before installation begins, check to ensure that an erosion hole has not developed under the rail.

The south bank should be reinforced with a two-gabion length complex just downstream of an angled gabion as well as the plywood bulkhead.

Check to see if the winch stanchion and north bank deck is intact. The deck surface should be level. The stanchion should be upright and straight. The base of the stanchion should line up with the end of the rail and a pulley should be mounted where the stanchion and the rail meet.

The weir trap and funnel should be secured to fence posts on the south bank. They are oriented parallel to the bank and the trap is upstream of the funnel.

The four weir panel piles should be secured to fence posts and covered with plywood and aluminum panels to help protect the plastic from ultraviolet (UV) light.

The Beebe winch can be found on the floor of the tool shed next to the cabin.

The chain link fencing should cover 4–5 ft above and below the whole length of the rail. The fencing rusts over time, so it needs to be inspected for weakness. Do this by tugging firmly on the chain link, rusted chain link will break easily, and must be replaced. Directions for replacing the chain link can be found at the end of this appendix.

PREPARATION

It is important to realize that it is better to take your time during weir installation, do a good job, and make sure all needed repairs are done before anything goes into the water. This will lead to less weir maintenance later on for the crew. It also means that at the end of the season everything can be put away quickly because there will be less repair work. Keep this in mind when considering the condition of the weir panels, the rail, and the chain link fencing on either side of the rail. These components are both extremely important and extremely time intensive to replace or repair. These repairs cannot be put off till the end of the season.

The rail's entire surface, including all of its eyes, must be cleared of all silt and gravel. A dry suit, hood, snorkel, mask, and sturdy garden rake are needed for this task. Rake substrate off and downstream of the rail surface. Ream out each rail eye with an individual rake tooth. This action is necessary to clean each eye, facilitating cable stringing and preventing the cable from jamming during installation. If the rail has been undermined, sandbags will need to be placed both upstream and downstream of the rail to fill the void. After the sand bags have been positioned, a piece of chain link fencing should be securely staked down over the sand bags by driving metal "J" hooks around the edges of the new piece with a heavy hammer. High water events have caused damage to the chain link fencing over recent years so repairs are usually necessary before weir installation. The chain link fencing should cover 4–5 ft above and below the whole length of railroad rails.

The next task is to clear sediment from the area around each rail end near each bank. This is necessary not only to clear the eyes on the rail, but also to preserve visibility in the water when installing the first and last panels. This makes installing these panels much easier. The next task is to install the Beebe winch on the stanchion and string the cable through the rail eyes. Two steel "J" hooks located in the tool shed are a handy tool for lifting the awkward, heavy winch. Insert each "J" hook through a different pair of bolt holes on the mounting flange of the winch. By holding the hook, two strong people can carry the winch down to the winch deck. It is ideal and safer for four people to carry and install the winch if help permits.

The winch is mounted to the stanchion with four bolts, washers, and nuts located in a zip lock bag in the gray plastic toolbox in the shed. The winch is bolted to the north side of the stanchion with its handle pointing downstream. Insert the bolts through the winch and attach the washers and nuts on the south (offshore) side of the stanchion.

Loosen the winch cable from the spool and pull the cable down the stanchion between the stanchion and the pulley, then under the pulley and through each rail eye. One person operates the winch providing cable slack while another person, in a dry suit, pulls out about 10 to 15 feet of cable at a time and then threads the cable end through each eye in the rail. If more slack is pulled out at any one time, the cable tends to get snagged on itself. This process is repeated until the cable is threaded through all the eyes across the river. Extreme care must be taken to thread the cable through all the eyes in the rail. If any of the eyes are missed, any work toward installation of the weir will have to be undone to rethread the cable.

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Upon reaching the south stream margin, loop the winch cable through the south bank deadman anchor cable and clamp the cable back on itself. (A deadman loop should be protruding through the plywood of the bulkhead right over the end of the rail.) Before clamping the cable on, measure the distance of the first weir panel's cable hook from the edge of the panel. (The first panel is one of two unique panels stored on the south bank with "gasket" material (herring web) attached to the left side of the panel, when looking at the panel right side up from the upstream end.) The loop formed when the winch cable is clamped on itself must be shorter (including all the clamps attaching the cable) than this distance to prevent interfering with installing the first panel snugly against the bulkhead. Three cable clamps are sufficient to attach the cable. Cable clamps must be tight so the cable will not slip under the strain that will be on when the weir is installed. The clamps should be attached with the cable end to the clamp loop side. Ideally, the cable clamps will also be installed on the shoreward side of the closest eye on the rail.

The next task is to prepare the panels which are stacked in neat piles on both sides of the river. Upon reconstruction of the new weir in 2008 panels were separated as "A" and "B" panels to eliminate confusion. The cross members on the "A" panels are spaced differently than the "B" panels so the straps for the connector rods align correctly when installing the weir. The "B" panels are differentiated by the orange spray-painted end caps. The south bank should have a total of 26 panels (13 "A" panels and 13 "B" panels). The north bank should have a total of 14 panels (eight "A" panels and six "B" panels). Unwire the panel stacks and consolidate the lengths of wire by placing them on the winch deck. Pull the fence posts out of the ground and store them away from the panels to prevent tripping. Carry the panels one at a time, towards the river upstream of the weir. Two people can easily carry one panel. One unique panel is a bit narrower than the rest (only nine pickets wide) and will be needed for the last panel to fit between the bank on near side. Be sure you have everything prepared prior to installing the weir.

Repair work on panels should be done before they are in the water. It is easier to repair the panels on land, and the quality of work done is accordingly higher. It saves time and effort to do repair work at the start of the season. Quality repair work also leads to less time spent on weir maintenance later in the season.

Most of the straps for the connector rods will need to be replaced before installing the weir. Replace any straps, cross-member pieces, pickets, or eyebolts as needed to maintain the function of each panel. Flag repair sites with surveyor tape and remove tape after repairs are made. There should be a total of 4 panels (3 on the far bank, 1 on the near bank) with gasket material attached to them in preparation for connecting with either a stream bank or funnel opening. All four panels with webbing are "A" panels. Ensure that these gaskets have no holes and the web is not rotten or in need of repair. The web should be wide enough to allow the floating panel attached to it to move freely in response to extreme changes in water levels while still not allowing fish to escape upstream. The gasket should extend along the entire length of the floating panel to which it is attached. The gasket on the panel interfacing with the north (near) bank will need especially deep web material since the shoreward attachment point is up over the bulkhead wall on the edge of the winch deck. The gaskets for panels proximate to the far bank and the funnel should have an uncapped 13-foot length of PVC pipe (connector pipe) laced to the edge of the gasket opposite the side attached to the panel. Make sure the lacing is snug and in good repair. If a panel needs to be repaired and/or rebuilt, the necessary hardware and notes for panel assembly can be found at the end of Appendix D2.

The far side also should have the fish trap with two gates and numbered panels for the trap. Two long gang-plank boards used as a cat-walk to the trap from the bank can be found under the cabin and need to be brought across the river. All the PVC pipes (connector rods) for securing the panels next to each other are also located under the cabin. You will need at least 37 connector rods for completing the weir. The aluminum panels in which the panels are stacked on need to be taken to the other side of the river, and are used for the caging around the funnel frame.

INSTALLING PANELS

The weir is 40 panels wide. Panels are installed one at a time starting from the south bank (far bank) stream margin and progressing across the river toward the north bank and the winch stanchion. Begin with an “A” panel that has webbing material. A “B” panel is installed next, then another “A” panel with webbing. After the first three panels are installed, the funnel frame can be carefully carried down the bank and placed on the downstream side of the railroad rail. The funnel can temporarily be stabilized by putting few sand bags on it to prevent it from shifting or moving downstream. Another “A” panel with webbing is installed on the other side of the funnel, then alternate B, A, B, A from this point on.

After the fourth panel is installed, vice grips are needed to keep the panels in place. At least four vice grips will be needed during weir installation. Begin with a pair on each panel proximate to the funnel. For the panel south of the funnel, put each of the two vice grips on the cable immediately north of each of the two hook eyes. For the panel north of the funnel, put each of the two vice grips immediately south of each of the two hook eyes. Make sure that each vice grip is clamped as tight as possible on the cable, to prevent slipping.

As a reminder, the first, third, fourth and 40th panels have gasket material on the appropriate edge necessary to interface with either of the banks or the sides of the funnel.

To install each panel requires (at least in the swifter/deeper sections) two people to handle transporting panels into and maneuvering in the water. These folks will all need to be in dry suits with snorkels and masks and (in deeper sections) weight belts. A fourth person (if available) will operate the winch. If a fourth person is not available, one of the other three people will have to walk back and forth between the weir panel installation site and the winch stanchion when necessary to operate the winch.

First, one person unlocks the winch and lets out slack (usually about 15 rotations of the handle when the winch is in the slower gear) while a second person pulls the excess cable upstream in a slight loop in the area where the panel is intended to be installed. The cable should have enough slack so the cable can be lifted 8–12 inches off the rail.

By staging the majority of the panels upstream of the rail, the panels can be more easily maneuvered into position as they are floated across and downstream and pulling against the current will be minimized.

The panel is floated into a position slightly upstream of the rail where it will be installed and held there by the two people holding onto the panel. A third person pushes down on the upstream end of the panel while reaching down and hooking the loose cable onto the pair of hook eyes in the foot of the panel.

When it is in the correct position, a signal will be given to the winch operator to take up the slack previously paid out. As the slack is being slowly taken up the panel should be continually checked for correct placement and adjustments should be made to the location of the panel as necessary. At this point the winch operator should ensure that all slack is taken back out of the cable. The foot-plate of each panel has short metal pegs or “ears” which stick out on either end. The PVC connector rods that join neighboring panels will slip down over these ears to rest against the foot of the weir. When in the correct position, the ears of neighboring panels should line up and be in close enough proximity so that the end of a connector pipe (16-foot length of 1” conduit with no end caps) will slip over both ears. It is sometimes necessary to make slight adjustments in panel location once the cable is already tightened. This may be accomplished by judicious use of a short crow bar or three pound hammer to move a panel slightly. (All tools used in water should be spray painted orange prior to weir installation to assist in finding them if dropped.) Care should be taken not to pry or hammer on the edge pipe or pipe clamp as they may be easily pulled loose.

Once each panel is in correct position and the slack is taken from the cable, a connector pipe must be installed to connect it with the previously installed panel. This takes the teamwork and finesse of the two people left in the water. If connector rings between the panels line up and do not overlap, the cross member on the panel being connected can be moved up or down slightly by tapping on it with a hammer so the rings can be lined up. One person threads a connector pipe through the rings starting with the most extreme downstream ring between the two panels being connected. Most connector pipes will have small holes drilled into them closer (about one third of their length) from one end than the other. When threading these connector pipes, position the pipe so the end furthest away from these small holes is upstream (and threaded first through the connector rings).

The other person (preferably the lightest person, as they will warp the panels less with their weight) straddles the adjoining panels and threads the up-stream end of the pipe through the rings and over the ears on the upstream end of the panels as the first person gently pushes the connector pipe upstream. When installed, the connector pipe should fit snugly over both ears of the adjoining panels. (The person pushing generally gently pushes while simultaneously twisting the pipe to help it more easily thread through the rings.)

After the connector pipe is installed, and the panel is inspected to make sure it is installed correctly, a pair of vice grips should be clamped tightly on the cable immediately north of each of the hook eyes on the recently installed panel. As panels are installed across the river, the two most recently installed panels should be clamped with vice grips to prevent the partially installed weir from slipping on the cable when slack is paid out for subsequent panel installation. In addition, vice grips should be left holding both panels next to the funnel until the entire weir is in and the funnel is installed. As weir panels are installed sequentially across the river, vice grips can be leapfrogged to newly installed panels from ones further back that no longer need to be held in place.

Once the vice grips are in place, the panel installation process is repeated, first by loosening the cable, and then installing the next panel. It may be necessary to use the narrower panel in the final (39th) location on the rail proximate to the north bank if there is not room for the full width one with gasket material on the right side (looking at it from the bottom, right side up).

TRAP AND FUNNEL INSTALLATION

After all the panels are installed, the trap and funnel complex is installed. First it is necessary to clean and level the trap site by removing sandbags and excess gravel. This is necessary to insure the trap floor (made of white sandbags) will be low enough, even at low waters levels, to be conducive to fish trapping and passage. The site should be level and slightly deeper than the surrounding riverbed. The rough outline of last year's trap location should be apparent from the general sandbag pattern of distribution and can be used as a guide when preparing the site.

Once the site is prepared, the trap frame, stored on the south bank, is carefully carried into the river (this will take three to four people) and placed in the slightly depressed hole prepared for it. It may be necessary to remove the frame and remove additional gravel to make it level and low enough. When in place, the downstream end of the trap should fit snugly up over the rail. The trap should be oriented roughly perpendicular and upstream the rail.

Next, the aluminum panels (also stored on the south bank) are zip tied or wired to the outside of the frame on each side. Each aluminum weir panel (already numbered) is placed straight up and down in the spot corresponding with the same number marked on the frame. The bottom of each panel should fit snugly in the angle of the frame so no gaps exist where fish could get through. There should be four panels for each side. Next, six fence posts should be driven into the bottom (about 12–18 inches) near the upright members of the trap frame outside the trap with a post driver. They should be wired or zip tied tightly to the trap frame to help hold it in place.

Next, the bottom of the trap is lined with a layer of white sandbags. Just upstream of the trap, position the flash panel for counting fish. Sand bags will be needed to hold down the flash panel. Sand bags are also used to hold the trap in place, make fish in the trap more visible and seal any minor holes where fish might escape. Finally the sliding door panels are installed in both ends of the trap. Make sure that the doors open and close easily. It may be necessary to realign a frame or trim a door panel to make it slide easier. Also make sure each door fits snugly to the sandbags comprising the flash panel so that fish will not pass undetected when it is closed.

After the trap is in place, the funnel that is already in place can be adjusted to line up with the trap. First, the stream bottom where the funnel will be located must be cleared of any stray sandbags or bigger rocks. The bottom does not need to be as smooth or flat as it is under the trap because the funnel (with the exception of the extreme upstream end) will be suspended off the bottom on fence post “legs” to allow the fish (moving back and forth behind the weir) to line up in the funnel and pass into the trap. The upstream end of the funnel frame is marked and should be placed so the bottom corner of the upstream end is resting on top of the rail.

The next step is to ensure that there is enough space to hang aluminum weir panels on the outside of the frame (the preferred method). The weir panels are about two inches thick and the floating weir panels on each side of the funnel must have room to move up and down in response to changing water levels. There should be almost no friction between the panels and the sides of the funnel. If it seems likely that friction will occur, weir panels will have to be hung on the inside of the funnel frame.

Assuming weir panels can be hung on the outside of the frame, fence post “legs” are driven into the bottom (approximately 12–18 inches deep) just inside the frame near the upright members. Two posts should be driven in each corner on the extreme downstream end and, two on the next (upstream) set of upright members of the frame. The fence posts should be driven as close as possible to the frame.

Next, the frame is lifted on the downstream end and held high enough off the bottom so that the frame is approximately level. While one (strong) person holds the frame in this position, the frame is lashed tightly to the fence post legs with bailing wire and/or zip ties. (Large zip ties are preferred over wire in recent years due to the reduced possibility of fish getting injured by them.) The upstream upright members of the funnel should be in close contact with the downstream end of the trap at this point. These should also be lashed together in a way that avoids interfering with the operation of the downstream gate.

After the frame is securely in position, a total of four panels (two on each side) are hung (hopefully on the outside) of the frame. The panels used for the funnel are positioned horizontally (parallel to the waterline). The upstream panel on each side should be low enough (on the upstream end) to touch the bottom, but (on the down-stream end) still allow fish to pass under as they move back and forth behind the weir. The downstream panel on each side should be staggered slightly higher but still horizontal so that the aluminum panel will be in contact with the adjoining floating weir panel throughout its entire length at all probable water levels. Staggering it about 10 inches higher than the upstream panel works fine. Panels should be wired or zip tied to the frame securely.

If it becomes necessary to hang the panels inside the frame, due to the gap reserved for the funnel not being wide enough, then the fence post “legs” are driven outside the frame (and out of the way of the panels).

GASKET INSTALLATION

After the funnel and trap are in place, the four herring web gaskets need to be attached either to a bank or a side of the funnel. On the south bank, a connector pipe (13 foot long piece of 1” PVC pipe with uncapped ends), already laced to the edge of the gasket material, is attached to the plywood bulkhead wall with nails and pipe hanger. On the north bank, the shoreward edge of the gasket is affixed to the edge of the winch deck by nailing 2x4s down over it. On each side of the funnel a connector pipe, already laced to the edge of the gasket material, is zip tied or wired (snugly) to the outside of the funnel. Care must be taken to ensure the gaskets are attached so as to allow the proximate floating weir panels to move freely in response to varying water levels and not let fish escape upstream undetected.

SECURING CONNECTOR PIPES

After the gaskets are installed the next step is to secure the connector pipes between floating weir panels so the water does not cause them to back off the connecting ears on the upstream corners of adjoining panels. Most connector pipes, if already used, will have small holes drilled about one third of the way upstream from the downstream end of the connector pipe (if installed properly) and just upstream of the most downstream set of connector rings. A six-inch piece of wire is threaded through these holes and twisted back over itself two or three times. If a hole is not in the right spot, a cordless drill can be used to put one where it is needed. All 37 connector pipes should be secured in this fashion. (Do not drill hole while standing in the water! Any holes in connector pipes should be drilled from the bow of a skiff.)

The last task before declaring the weir fish tight is to look for and plug any leaks in the weir. A dry suit and snorkel are necessary to closely inspect the entire weir underwater for any holes that could potentially leak fish. Holes are not always apparent when looking through the surface of the water.

Generally, a hole in the weir wider than 1.25 inches or so could potentially leak fish and should be plugged. Look for irregularities in the weir or the bottom, which could be potential leaks. Holes close to the bottom can usually be plugged with a couple of carefully placed sandbags. Holes higher in the water column might be plugged by using a zip tie or wire to secure a picket near the center of an existing void. Pay special attention to the upstream end of gaskets near the rail. Also inspect the trap to ensure fish will not escape under the sides of the trap. Usually, several sandbags are placed around the outside of the trap to ensure fish will not escape. The usual trouble spots near the trap are on the downstream end, near the rail. Scouring could develop into a problem especially just after the weir is installed so also look for developing holes under the rail.

BUOY INSTALLATION

After the weir is installed, buoys are tied off underneath the weir panels to help elevate the floating end. The buoys are located in the attic of the cabin. The easiest way to do this is to have two people grab the end of a panel and lift up while another person goes under the panel and passes the rope through the pickets and back through to tie a quick half-hitch. The buoys are tied off around the third cross member of each panel to prevent slipping.

It is extremely important to not lift the panels too high because the connector rods and/or the pickets could break. Once the weir is completely installed, any vice grips left on the cable can now be removed and put away.

A CAUTIONARY NOTE

It is important to be cognizant of safety issues. Weir installation can involve difficult tasks done in inclement weather. If someone is not sure of the exact steps necessary to complete a task or if current conditions do not allow them to be done safely, it is best to ask someone with more experience before attempting to accomplish a goal. The weir installation process is progressively more difficult as water levels get higher. At some point (around 2.8 feet on the water level gauge as it is currently set at the weir site) weir installation becomes impossible due to high stream velocities. Even at lower stream levels, visibility can sometimes prevent weir installation.. If moderate or higher water levels are present, four people are necessary to accomplish some of the tasks associated with installation. Typical water temperatures during the normal installation time run about two to four degrees Celsius. Avoid working long hours in the water as fatigue and low body temperatures can contribute to bad decision making and higher accident risks. The application of common sense is necessary to make safe operational decisions.

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NELSON RIVER WEIR PANEL ASSEMBLY

Panels are 21 PVC pipes wide

- 5 cross members per panel (UV resistant plastic decking material)
- “A” panels = 36” apart between each cross member
- “B” panels (spray paint end caps orange) = 34” apart between the “hooking end” and first cross member, then 36” apart between the rest of the cross members

TOOLS NEEDED FOR WEIR PANEL ASSEMBLY

- 1 1/8” spade bit (for counter sinking holes for eyebolt washers)
- 3/4” spade bit (for counter-sinking holes for cross member bolts & washers)
- 1/4” drill bit (for all hex head bolts)
- 3/8” drill bits (for eyebolts)
- 7/16” socket head with drill attachment
- 9/16” socket head with socket wrench
- 7/16” open end wrench
- 9/16” open end wrench
- Lots of C-clamps (use bigger ones for clamping the header piece, smaller ones for clamping cross members)
- Cordless drill guns with 18 volt batteries and charger
- Tape measure (for measuring the correct distance between each cross member)
- Hammer

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HARDWARE USED FOR WEIR PANEL ASSEMBLY

- 4 ½” hex head bolts (for the hooking end or “header piece”)
- 3” hex head bolts (for securing the two cross members together)
- 3 ½” hex head bolts (these were used for pre-assembly layout, not needed for final assembly)
- 7/16” washers and nylox nuts
- 9/16” eyebolts (anchors panels to cable)
- 9/16” washer and nylox nuts
- Aluminum plated “dog ears”
- Black strapping

MAINTENANCE

The weir should be thoroughly cleaned and inspected at least once a day. During high water events it may be necessary to clean the weir more than once due to extra debris buildup. To inspect the weir requires a snorkel mask and dry suit, as not all holes may be visible from the surface. Cleaning the weir requires a brush, used to scrub the panels and remove algae build up. It saves on time and effort if the inspection and cleaning are done at the same time.

During high water events the weir has a tendency to be pushed under water because of the fast current. Extra buoys should be added to weir in order to keep the top above the water. The buoys should be added preemptively, as it is almost impossible to add buoys to the weir when the water is high and fast. If snow melt is on the way, or if it starts to rain heavily, do not wait for the water level to rise before taking action.

REMOVAL

The first task when removing the weir is removal and storage of all buoys. Once completed the gangplank boards and sampling station should be removed and stored. Next all gasket panels should be removed. This will free the trap and livebox for removal.

Removal of the trap and live box will likely require at least four people, although three strong individuals may be able to accomplish the task with ample time. Fence posts used to anchor the live box should be removed, and the live box detached from the funnel by removing the connecting bolts. Panels should then be removed from the live box by cutting the bailing wire. Panels should be stacked neatly on shore away from the river bank. Sand bags then need to be removed from the live box and funnel. Once the live box and funnel are completely detached and free standing one person should stand at each corner of the funnel. With everyone lifting at once the funnel should be carefully carried to shore. Next the live box should be removed. The live box is very heavy, and the crew should be careful that injury does not occur when moving it. The live box should be carried and set next to the funnel. Fence posts should be driven around the live box and funnel, and everything should be secured together using rope or bailing wire.

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The boat should be set up as a platform to stack panels on once they are removed from the cable. All connecting pickets should be removed before anything else happens. Make sure to remove any zip ties or hose clamps that may have been used to patch holes over the season as well. From this point forward there should not be anything attaching the weir panels to each other. They should be attached only to the cable.

The next part proceeds quickly. The cable should be loosened slightly. Starting at whichever end of the river is preferred, one person will stand downstream of the panel, the other upstream. When the signal is given the downstream person will push the panel upstream so that the upstream person has just enough slack to unhook the panel from the cable. This should be one fluid motion. Six to eight panels may be stacked on the boat at a time so that the crew does not have to walk back and forth to remove panels from the water after every unhooking.

The panels should be stacked neatly on shore, away from the river bank in case of flooding. Posts should then be driven in surrounding the panel stacks, and bailing or rope should be used to secure the panels. Remember that the panels are made to float, and any panels not secured properly will end up downriver after winter and spring flooding.

At the end of the season all weir materials should be neatly stacked in an organized manner and thoroughly secured with fence posts, rope, and bailing wire. This will save time at the start of the next season by preventing a hunt for lost weir materials.

SANDY RIVER WEIR INSTALLATION

MATERIALS

All weir installation materials are stacked on the bank of the river at the installation location, about 1½ miles downstream of the cabin. You will need the following items to install the weir and do repairs on the tripods:

- claw (framing) hammer
- 2–3lb hand sledge
- hand saw
- wire cutters
- vice-grips
- 16 penny nails (for attaching sandbag platform boards and catwalk boards)
- 20 penny nails (for stringer supports)
- dock spikes (for reinforcing main tripod timbers)
- a number of 2x4's (for tripod sandbag platform)
- bailing wire
- dry suit, mask and snorkel

LOCATION SELECTION

In 2002, the Sandy River weir was relocated approximately 1.5 miles downriver from the previous location. The old site was prone to washout during high water and wind events due to the long, straight stretch of river above the weir. The old site also had a very deep channel mid-river which concentrated the force of the river on the weir in that location. The main criteria for selection of the new site were: 1) to find a location below a bend in the river or behind an island which would provide a very short fetch to preempt wave formation and, 2) to find a location with a uniform depth across the river's cross section to mitigate flow concentrations from deep channels. The new site location in 2002 proved successful with little substrate erosion.

The presence of a weir can significantly affect the deposition of river substrate. A trough often forms just upstream of the panels over the course of a summer, and deep channels will form where sections of the weir may have washed out in the past. Over the course of the winter, some of these voids will partially fill with loose and poorly consolidated gravel. If the weir is installed over these areas, the loose fill will once again erode easily and put the integrity of the weir in jeopardy. It is important to recognize these features, as they will have a large impact on how well the installation proceeds and how the weir weathers high, fast water. When preparing to install the weir, it is important to begin by walking transects across the river in the intended location to determine where the most uniform and level substrate is to be found. Moving ten feet up- or down-stream can make a large difference in terms of encountering depressions, gravel bars, or poorly consolidated substrate. Taking a little extra time when selecting the exact location can prevent serious problems later.

Sandy River water levels are generally low in spring when the weir is installed, but can be expected to rise significantly (two feet and more) over the course of the summer. In some years, two distinct

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peaks in water level can be observed which correspond roughly with the peaks in the salmon runs (especially at Bear River). The water can rise as much as two feet in a few hours, usually as a result of heavy rains and/or high winds off the lake and melting glaciers located on volcanoes, so be prepared for the worst early in the season.

TRIPOD PLACEMENT

Place a stake or sandbag on each bank at either end of the chosen transect so that you have a target to work towards and a fixed reference point to sight-off of to check tripod alignment. Begin on the near (northeast) bank with the older, weaker tripods where the current is weaker. Check the 20-penny nails in the front leg of the tripod where the stringers will rest before placing them in the water, as it is hard to drive new ones in place when the leg is underwater. When rolling the tripods down the bank to the river, make every attempt to be gentle so that the timbers do not split or part, and that the nails on the front leg are not bent.

Place the tripods so that the back legs have about four inches of gap between them (the width of your foot) for the shorter tripods and no gap (bottom of the rear legs touch that of the next tripod) for the larger ones. It can aid in tripod alignment if stringers are mounted on the front leg as you work. Make sure there is 6-8 inches of overlap on either end of the stringer where it meets the tripods. Adjust the spacing of the tripods to maintain adequate stringer overlap. Allow more overlap where the current is stronger and the water is deeper. This will allow some tripod settling and traveling without the stringers being pulled off the front leg.

As you work, check the alignment by sighting down the stringers towards the target stake or sandbag on the far bank. The tripods placed in deeper water may require some sandbags to keep them from moving in the current. Because the tripods will float when placed on their side in as little as two feet of water, it helps to roll the tripods upstream some distance and then roll them into the river and float them across the river until you are upstream of the spot where you want to place it. Allow it to float down in the current until it is about ten feet upstream of the desired placement, and then stand it up. Slowly walk it back into position and have someone hold it while others go back to the bank for sandbags to secure it.

Another way to move tripods to the deeper parts of the river is to use the skiff. Place the tripod in the river, facing upstream, near the bank in about two to three feet of water. Walk the skiff under the back wing support (the crosspiece below the wings) until the bow of the skiff is under the tripod's sandbag platform. Roll the tripod back on its back legs until the crown of the tripod is resting on the bottom of the skiff and the main bulk of the tripod is resting on the bow. The wings of the tripod will hang down into the water on either side of the skiff. This is a very effective but precarious way to move tripods as it is easy to swamp the skiff with such a large, unwieldy load. Be sure to load at least ten sandbags in the skiff to secure the tripod once it is unloaded into position. Drive the skiff slowly up behind the position you wish the tripod to occupy, and then further, slightly upstream of the other tripods, before unloading the tripod. You have to drive slowly because the tripod wings are hanging down into the water and any speed will cause these to drag enough to make the tripod slide back in the skiff. As the tripod is tipped upright the front leg will sink down into the water and will contact the river bottom. Slide the wing support

off the bow of the skiff and have someone immediately step onto the sandbag platform to keep the tripod from shifting until the sandbags are loaded. It is important that the tripod be unloaded upstream of the intended final position because moving the tripod against the current is nearly impossible without loading it back into the skiff and driving it.

Once you have found the correct position for the tripod, push it back and forth forcefully to work the legs down into the gravel and set them in place. This will help minimize movement later. Recheck alignment periodically. Proper alignment of the tripods is critical to having the panels lay flat on the stringers and prevent gaps between panels later. A little extra care and effort at this stage can save countless hours of weir maintenance later in the season when the water level rises.

Once the tripods are set and the stringers are on, spend some time loading the platforms with sandbags as the resistance will increase dramatically once the weir panels are put on. The tripods in the shallow, slow moving water near the banks may need as few as ten sandbags each, while the deeper tripods will require 40 or more. If you begin installing the weir late in the afternoon, this is a good place to stop for the day to allow the tripods to settle down into the substrate overnight before adding the resistance of the panels. This additional resistance can cause the tripods to settle back as well as down, negating much of the effort devoted to alignment.

Keep in mind that the weir generally fails due to sandbags being washed off the tripod platforms, so sandbag placement is critical to surviving episodes of high water. The sandbags should be wedged between the tripod legs as tightly as possible. Eventually, additional sandbags can be stacked on the wings behind the back legs, and a small platform can be added to the crown of the tripod for additional bags. Nail one or two planks across the back of the rear legs above the wing support to keep sandbags from washing off the back of the platform once it is loaded. Sandbags that are underwater are only fractionally as useful as those above the surface of the water as they “lose” much of their weight when submerged, and increase resistance to the water flow. As most of the tripods in the deeper section of the river will have their sandbag platforms well under water during flooding events, stacking as many sandbags as possible on accessory platforms added to the crown of the tripod can mean the difference between washout and surviving the high water event. Use the skiff to shuttle sandbags.

PANEL INSTALLATION

Place the panels on the weir starting on one end making sure that the panels are perfectly perpendicular to the water surface. You will likely have to dig into the substrate to allow the entire bottom of the panel to rest in the gravel as you descend the banks or move past irregularities in the gravel. Hop up and down on the t-angle crosspiece of the panels to push the panel down into the gravel. In the past, longer panels were installed in the deeper, center sections of the river, but a more recent strategy has been to use shorter panels all the way across and allow the river to flow over the tops of the panels during high water events to reduce the resistance. Fish have not been observed escaping over the top of the panels in these instances.

As you go, do not forget to install the three gates at intervals that cover different water depths. Two gates will be used as fish passes, and one will lead into the sampling trap. As the water level and turbidity rise, you may need to switch to a fish pass gate in shallower water, so install the gates leaving yourself some future options (such as one in moderately deep water, and another closer to the bank). Think about where you want the trap and install a gate for this purpose as well.

Finally, put the catwalk boards on and use them for shuttling more sandbags onto the weir. All boards should overlap on a tripod wing. If necessary, blocks can be nailed to the tripod wings if the catwalk board does not meet the wing properly. During high water events, the catwalk will likely be underwater. The boards wash off easily and so should be removed if their loss seems imminent.

Line the entire front of the weir with sandbags to prevent scouring below the panels. Some have found it more effective to line the backs of the panels with sandbags instead. It may be prudent to experiment with either placement or use both in areas more susceptible to erosion.

Zip ties or bailing wire are used to attach the panels to the stringers and join panels where they meet in order to keep the panels from shifting. While this preempts some minor holes from forming, it also makes it more difficult to push panels down or move them relative to each other when gaps do form. Wiring the panels in the shallow water only could be a safe compromise. Bear activity can also knock panels loose. Zip tying panels to stringers or stacking numerous layers of panels on the weir both help reduce the likelihood of a bear creating a hole.

MAINTENANCE

The weir should be cleaned at least once a day. During high water events it may be necessary to clean the weir more than once a day. Sandy River can have a lot of debris wash down river. If care is not taken to keep the weir clean it will wash out.

Cleaning the weir will usually take two people 20–40 minutes depending on how high the water is and the debris load. Dry suits are required to clean the weir, as many very large pieces of turf tend to wash onto the weir due to erosion upstream. It is impossible to get these pieces of turf off the weir without diving. It may also be convenient to carry a rake when cleaning the weir in order to work out rocks and other debris that may be caught in the weir panels.

When cleaning the weir try not to kick up rocks and gravel. The current at Sandy River is fast, any debris kicked up will have to be cleaned later. Generally when moving along the weir it is best to stay on top of the sandbags, or to crawl along the weir panels themselves.

REMOVAL

The weir should be removed small sections at a time. Starting at the far end of the river, sandbags should be removed from the foot of the weir, followed by panels, stringers, and eventually the sandbags weighing the tripods down. Be sure to leave enough sandbags on the tripod to keep it from floating away. The boat should be used to ferry these items back to shore to be stacked neatly. A separate boat trip should be made for each tripod.

The tripods should be arranged neatly for easy access during the start of the next season. All items should be stored away from the river bank, as spring flooding and ice may easily carry weir materials downriver if left on the river bank. The ATV and trailer should be used to move tripods and other materials away from the river bank. Take care not to overload the ATV or the trailer.

Once all materials are out of the river and stacked neatly they must be secured. Rope should be used to tightly bind all the tripods together, preventing bears from separating them, and preventing flooding events from carrying single tripods away. The panels should be anchored down either with fence posts, ground line, and bailing wire.

ILNIK RIVER WEIR INSTALLATION

MATERIALS

All materials for the weir are stacked on either side of the river bank. The materials are divided roughly in half on either bank. You will need the following items to install the weir:

- Post hole driver
- Crisco shortening (non-petroleum based grease) for pushing PVC pipe through rubber straps
- 300 hundred heavy duty zip ties
- Dry suits, gloves, mask, snorkel, and hood
- 2–3lb hand sledge hammer
- Large rubber mallet
- Metal fid to guide pipe through rubber strap
- Barge and hand winch
- 50 Metal fence posts
- Chainsaw winch or hydraulic block

LOCATION

The weir should be installed roughly in the same location as the previous year. The river should be walked in transects a number of times to determine where any holes, sand bars, or channels which could cause problems with scouring or installation might exist. Choose a transect which offers the smoothest, best consolidated, and most continuously regular substrate possible. Place a stake or sandbag on each bank at either end of the chosen transect so that you have a “target” to work towards and a fixed reference point to “sight” off of to check panel alignment. Keep in mind that the weir should run perpendicular to the river’s current in the deepest, fastest channel, which is generally, located closer to the far (south) bank.

It is easiest to begin on the near (north) bank. You will begin by dragging the panels into general position. When dragging panels, fold the foot chain and herring web over onto the panel so that it rests on the PVC, and pull the panel by the second PVC tube from the end, near a hypalon strap. Do not pull on the outermost tube as the tube is weakened by the glue holding the white stopper-rings in place, and may break. Laying the chain on the panel when dragging keeps the chain from being pulled loose from the webbing and keeps the web from separating from the eyelets at the bottom of the panel (the zip-ties break easily). It makes sense to be careful with the panels, as repairing them is extremely laborious and time consuming. If damaged panels are encountered, set them aside and flag the problem spot with surveyor’s tape and make the necessary repairs as soon as possible.

There are three different lengths of panels: five, 10, and 15 feet long measured from the herring web to the top caps. All sections are 10 feet wide. The longer panels belong in the deeper water and the shorter in the shallower. Some budgeting of panels will be necessary to have enough long ones, but care must be taken not to put too short a panel in water that may become much deeper on a high tide. As a general rule, the small channel near the near (north) bank requires ten foot panels. Five foot panels are adequate for the entire sand bar which dominates the middle of the river, then a number of ten foot panels are needed as the river deepens. Finally, 15 foot panels are necessary to block the deep channel by the far (south) bank.

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The first panel should be laid on the bank so that fish cannot escape around the end of the weir on extremely high tides. Drag a few subsequent panels into their general positions. The weight of the chain may cause it to sink down into the soft sand, making it difficult to move panels when this happens. Either leave the chain lying on the PVC tubes until the panels are in their final positions, or do not leave them unattended for long periods of time in the river; only bring panels out as you need them.

Lay the panels to be joined side by side and line them up so the white, lower end caps of the panels are in line. Pay attention to how the hypalon straps line up as well. The straps from the adjoining panels should not bind or interfere with each other. If they do not lay flat, one next to the other, it will be extremely difficult to drive the connector pipe through them. If necessary, move the panels to be joined relative to each other to see if there is a better orientation for the straps not to interfere with each other, or try to slide the strap up or down its panel slightly. Place a fid in the end of a connector pipe and lubricate the pipe with a thin layer of vegetable shortening. Make sure the connector pipe has a hole drilled through the end with the fid; a zip-tie will later be threaded through this hole to secure the herring web to the bottom of the joint. Carefully push the connector pipe through the available slots in the hypalon straps at either end of the panels to join them. It may become necessary to hammer the connector pipe in with a rubber mallet at the end. The fid fits loosely and it is easy to drop and lose it. It will be necessary to have the person guiding the fid through the hypalon straps float on top of one of the panels as the gap between the panels is too small to stand in as the panels are joined. The fid is sharp and care must be taken so that the person pushing the connector pipe does not accidentally drive the fid against the person guiding it. Good communication is essential here to keep the fid from being lost, and to avoid injury.

After the PVC sections are joined, the herring web must be sewn together with twine and a mending needle or with zip-ties. Join the sutured web to the piece of connector pipe via the hole in the bottom of the pipe using a zip-tie. Join the ends of the chain with a 6-8 foot length of light line looped twice through the chains and tied off in an overhand knot. Some sections of chain are considerably longer than the herring web or panels themselves and it may be necessary to “choke up” on the chain, or move back a few links so everything lays flat, without undue gaps, strain, or excess material. Make sure there are no holes in the web where the two sections are joined, or where the web joins the panels or chain through which a small fish could wriggle.

Once two panels are joined, pull the chain as taught as possible along the river bottom and pass a fence post through one loop of the doubled line joining the ends of the chain. Drive the fence post into the river bottom so that the toothed surface faces upstream and the fluke is perpendicular to the current. The entire post should lean upstream at about 30 degrees to resist the current’s tendency to pull the panels down river. Drive the post at least three feet down into the sand with a post-pounder.

As the river deepens on the south side of the sand bar, it will become necessary to use the barge to join panels. The barge’s main role is to hold the foot-chain up off the bottom so that subsequent panels can be added more easily. Working at or above the water surface is necessary to ensure that no holes are missed while sections are joined. The other critical function the barge serves is to store materials such as zip-ties, connector pipes, lengths of line, and a base of operations for people working in the water. The barge will be staged upstream of the weir, secured with one or two large anchors placed well upstream. The barge should be positioned so that the winch and davit are approximately three feet upstream and slightly

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beyond the end of the last panel in the river. This allows the barge to lift the end of the last panel off the river bottom and keep tension on it so that the panels remain straight and do not migrate downstream when lowered to the river bottom.

Load the next panel to be joined into the skiff with the chain end in the bow and one end of the panel laying on top and hanging slightly over the starboard rail. Drive the skiff to the downstream side of the barge and tie off to the barge so that the end of the panel in the skiff is roughly in line with the last panel in the water. Without unloading the new panel, join it to the last one installed with connector pipe and stitch the web together at the bottom. Tie the double line loop through the ends in the chain and pass a fence post through one of the loops before allowing the chain to settle to the bottom by unloading the new panel from the skiff and lowering the newly connected joint with the cable winch. Before dropping the end of the new panel out of the skiff, hook it to the cable winch so that it is above the water's surface and ready for the next panel to be joined.

As you work into the deeper channel where the current velocity increases, maintaining panel alignment towards the far bank becomes more difficult. It helps to secure the barge in the current with a large anchor placed well upstream and another line running to a deadman upstream on the south bank. In this way you can keep tension across the panels (via the deadman) and keep them from drifting downstream in the current (via the anchor). You will periodically have to move the barge across the river and maintain tension on the installed panels, and to be in an effective position to add subsequent panels. A well thought-out block and tackle system helps enormously to deal with the loads that the current places on the barge when trying to reposition it. Attaching the blocks to the line using prusiks or other “travelling” devices makes the system much more flexible. Having numerous cleats on the barge for a variety of tie-off options is a must.

Once all the panels are installed, crab floats (buoys) will have to be tied behind the panels, below the second hypalon strap down, to keep the top caps of the weir above water. One person can pass the buoy line under the panel while another person is on the panel ready to receive the line and tie it to a PVC pipe below the second hypalon strap with half-hitches (multiple clove-hitches). An alternate and faster way to attach the buoys is to use small plywood discs which the buoy line passes through. Make a 4-6 inch diameter disc and drill a hole in the center to pass the buoy line through. Tie a knot in the end of the line so the disc is not lost. In the river, turn the disc sideways so you can pass it through the panels, between the PVC pipes, from the downstream side, and then allow it to rest flat against the face of the panel. Pull the buoy line through the disc and snug the buoy against the back of the panel, holding it in place with a half-hitch with a bite (which you can untie easily).

The Ilnik Weir is prone to flipping during high tide and wind events. Flip boards should be installed the entire length of the weir to prevent flipping. Fence posts must be driven directly downstream of the weir, across the entire length of the weir. A rope should then be tied to the fence post, run through the weir underneath the second strap from the top, threaded through the eyes on the flip board, and then ran back under the second strap of the panel to be tied off to the next subsequent fence post. The flip board should allow the weir panel to pivot up, but not to move past 70 degrees, restricting its range of motion.

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MAINTENANCE

The Ilnik Weir is located close to both the Bering Sea and Ilnik Lake, meaning the weir experiences tidal forces and wave action. If proper precautions are not taken the weir will flip resulting in damage to the weir and gaps. Preventing the weir from flipping during high tides and high wind events is the primary maintenance concern at the Ilnik Weir.

To prevent the weir from flipping, flip boards must be installed as mentioned in the installation section of this appendix above. The fence posts securing the flip boards should be checked daily to make sure they are not being worked out of the sandy substrate of the river bed. If a particularly high tide is forecast, or if the weather is predicted to be extremely windy, extra flip boards should be installed preemptively.

The weir should be cleaned on a daily basis. A dry suit is required for this. All debris must be removed and the chain and gasket at the foot of the weir must be inspected using a mask and snorkel. The deepest section of the weir must be dove upon. It is recommended that two people perform this task, so that one person can hold the other down. It is difficult to inspect the deep channel alone due to the depth; 8–10 feet deep, depending on the tide.

Both the chain and gasket in the deep channel require constant maintenance. High tides combined with wind and wave action can often work the chain free of its fence post anchors. Once this happens the chain is free to move about during the next high tide event, meaning fish can escape every time the anchor chain lifts off the ground. To prevent this, the anchor fence posts and the rope securing the chain to the anchor fence post need to be inspected daily. If the rope is loose it should be tightened or retied as necessary. It is easier to spend time tightening rope fittings than it is to spend more time and effort later pulling bent fence posts, patching holes, and driving new anchor fence posts.

REMOVAL

The fish trap and sampling station should be removed first. The weir should then be taken apart in sections. It is important not to remove all the pickets and fence posts at once, this will result in a weir that is close to free floating in the river. Weir panels not anchored in the river can be washed downstream resulting in time and effort spent recovering lost floating panels.

Only detach weir panels which will be immediately removed from the river. When the panel is detached the chain should be lifted and laid on top of the panel, this will keep the anchor chain from ripping the gasket. The crab block should be used to pull the panel to shore, with two people escorting the panel to make sure it is not damaged in transit.

Each panel should be thoroughly inspected once it is on shore, and repairs should be made as needed. All weir materials should be secured once on shore in case of flooding; this will save time and effort later.

INSTALLATION

STAGING IN SAND POINT

Things to do:

- Make sure the skiff outboard is running properly. It should be test run in Sand Point. Be familiar with jet unit maintenance and operations and take necessary maintenance and repair equipment.
- Buy fuel. Approximately 25 gallons of unleaded and five gallons of diesel.
- Take propane. Three 100lb. bottles should be plenty for the project.
- Buy food. Plan on going without additional supplies until July. There is a propane refrigerator (a little smaller than standard size) which has a small freezer. There is a standard size propane oven in the cabin.

Things to bring:

- Firearms and ammunition
- Radios: SSB (M700 base station and Spilsbury mobile) VHF base station, hand-held VHF. Test all of these in Sand Point prior to departure.
- Tools
- Float coats
- Chain Saw
- 12 volt batteries (3)
- Spotting Scope or binoculars
- First aid kits
- Each person will need chest waders and rain gear
- Optical scan forms, scale cards, daily weir count forms, logbook
- Satellite Telephone

SETTING UP CAMP

The Orzinski Lake weir camp is typically set up between June 3 and 7. Camp supplies and personnel will travel to Orzinski Bay in the department skiff or aircraft. If an aircraft is used, a low tide will be needed for the beach landing. If the skiff is used, arriving at a high tide is desirable for transporting supplies up the inter-tidal river. If the tide allows, store gear at a location inside the river mouth as it is much more protected and easier to access at low tides. Use the 16-foot flat-bottom Lowe skiff that is stored under the cabin to haul gear upriver to the cabin site. In recent year normal water conditions, navigating the river under power has been very difficult and damage to outboard jet units has occurred. Pull supplies upstream without power until a safe path for jet unit operation can be identified.

INSTALLING THE WEIR

The following procedure is an efficient way to install the Orzinski Lake weir:

- Make 150–180 sand bags from the gravel bar just in front of the weir site.
- Install the tripods in a straight line perpendicular to the water current.

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- Initially, place at least 15 sandbags on each tripod.
- Install the stringers
- Install the panels. Panels should be wired to both stringers because of the frequent bear activity on the weir. There are two wooden gates that should be placed in the deep water.
- Line the bottom of the weir with sandbags. Place the sandbags at the base of the panels on the downstream side of the weir.
- Install the catwalk.
- A flash panel should be placed in front of the counting gate.
- A trap for sampling fish should be installed.

LOGS

Any logs in the lake within 150 meters of the weir should be moved above high water influence. This is much easier than pulling them off the weir when the water rises and will reduce the risk of weir damage during high water events. There are two pee-vees that can be used for this.

MAINTENANCE

The weir should be cleaned on a daily basis. All debris should be kept clear. The foot should be walked and checked for holes daily. Any holes bigger than two inches should be patched.

BEARS

Many bears inhabit the Orzinski Lake area. Thirteen bears have been counted at the same time from the cabin porch. Bears eventually become accustomed to loud noises or techniques used to deter them from the weir and camp. After the salmon have arrived, personnel should always carry a firearm. Anything left unsecured is subject to destruction by bears. All gear should be safely stowed behind aluminum panels to deter bears from destroying it. Keep the cabin door closed to prevent bears from entering the cabin.

Stay alert when walking from the camp site to the bay. If you stay alert and look around every few minutes you will usually see a bear before it sees you. When returning to the cabin, particularly in the evenings, there will often be bears behind the weir and up against the bank where you cannot see. Make a lot of noise when approaching the weir so bears have time to get out of your way.

Bears will swim from the beach to Orzinski Bay set net sites and pick fish from the fisherman's nets. This can damage nets and has prompted fisherman to shoot the bears. Be prepared to encounter a wounded bear. Practice with the firearm until you feel comfortable with its operations.

REMOVAL

All materials should be stacked neatly in their original location. Everything should be secured against both flooding and bear tampering.

**APPENDIX E. KEY TO FIELD IDENTIFICATION OF
ANADROMOUS JUVENILE SALMONIDS IN THE
PACIFIC NORTHWEST**

Key to Field Identification of Anadromous Juvenile Salmonids in the Pacific Northwest

By

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ABSTRACT

A key is presented with descriptive illustrations to help in field identification of live, juvenile salmonids in fresh waters of the Pacific Northwest. Other juvenile fish that may be mistakenly identified as salmonids are included.

INTRODUCTION

Species identification of live, anadromous juvenile salmonids is frequently a problem to the field biologist. The purpose of this key is to list and illustrate the external characteristics which will expedite field identification of juvenile salmonids in the Pacific Northwest.

Five species of Pacific salmon (pink, chum, sockeye, chinook, and coho); four species of trout (cutthroat, brown, Dolly Varden, and rainbow or steelhead); and other juvenile and adult fish¹ that may be mistaken for salmon or trout in fresh water are described in this key.

USE OF KEY

The characteristics for identification are listed in a series of alternative statements, some of which are illustrated. To use the key, examine the first statement; if applicable, proceed to the next and continue to successive statements until the species is identified. If a statement is not applicable, pass to the alter-

native characteristics indicated by numbers in parentheses (numbers on the drawings correspond to numbers of statements in the key). Continue in this manner until the specimen is identified. Some external characteristics are positive separating features (marked with asterisk), whereas others are not. Therefore, two or more statements should be considered before final rejection. If a precise identification cannot be made using the external characteristics—and the fish can be sacrificed, a positive identification can usually be made from internal features (marked with double asterisks). A bibliography of keys that utilize more descriptive internal characteristics is included in this paper.

KEY

1. (47) Adipose fin and scales present.
(Fig. 1)
2. (48) Fleshy appendage at base of pelvic fins present.
3. (49) Mouth large, reaching at least to center of eye.

Family Salmonidae

¹ Especially adult smelt, family Osmeridae.

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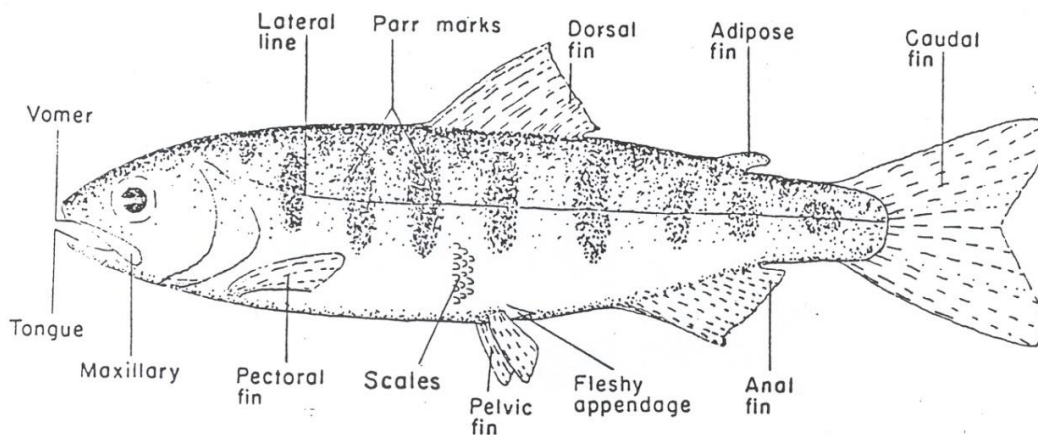


Figure 1.—A hypothetical salmonid showing external characteristics.

4. (17) Anal fin higher than long, with 8 to 12 developed rays (Fig. 2A)
5. (52) *Teeth on head and shaft of vomer. (Fig. 3A)

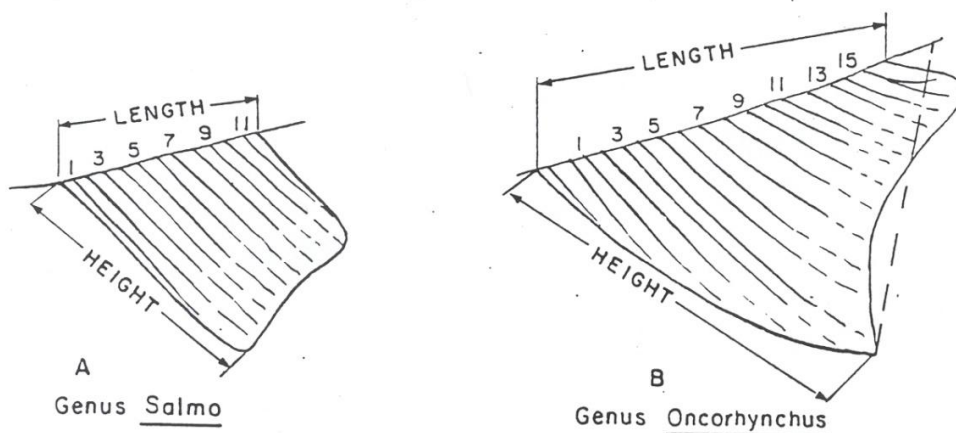


Figure 2.—Anal fins: (A) Trout, genus *Salmo*; (B) Pacific salmon, genus *Oncorhynchus*. The two drawings show differences in structure and fin ray count. (Note that the length of the anal fin is its overall basal length, and its height is that distance from the origin of the fin to the tip of the anterior lobe. In counting fin rays, include only those which originate from the base and terminate at the outer margin of the fin or are half as long as [or greater than] the longest ray.)

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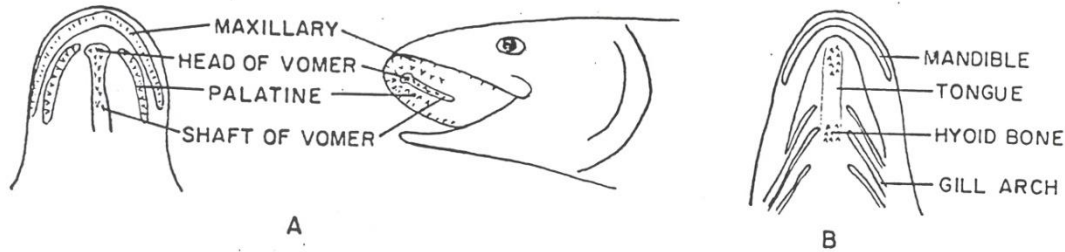
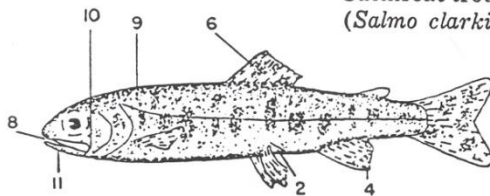


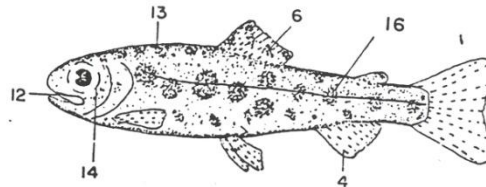
Figure 3.—Location of dentition in (A) the roof and (B) the floor of the mouth of salmonid fishes. (Presence or absence of teeth on the vomer or tongue may be determined by use of the little finger or a blunt instrument. The small hyoid teeth at the base of the tongue are located between the gill arches of the lower jaw and are difficult to find.)

6. (18) Dorsal fin with large dark spots.
Trout
Genus *Salmo*

7. (53) Adipose fin not orange; no row of pale round spots along lateral line.
8. (12) *Small hyoid teeth at base of tongue. (Fig. 3B)
9. (13) Not more than five parr marks on mid-dorsal ahead of dorsal fin.
10. (14) Maxillary reaching past posterior margin of eye.
11. (15) Red or yellowish hyoid mark under lower jaw. Tail usually black spotted.
Cutthroat trout
(*Salmo clarki*)

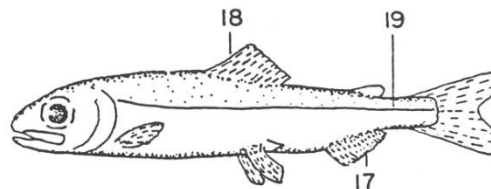


16. (20) Parr marks almost round.
Rainbow or steelhead trout
(*Salmo gairdneri*)



17. (4) Anal fin longer than high, with 13 or more developed rays. (Fig. 2B)
18. (6) Dorsal fin without large dark spots, may be black tipped.
Pacific salmon
Genus *Oncorhynchus*

19. (20) No parr marks. Fry leave fresh water while small—approximately 1.75 inches (45 mm) long.
Pink salmon
(*O. gorbuscha*)

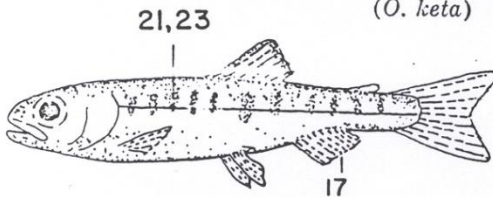


12. (8) *No teeth at base of tongue.
13. (9) Five to 10 parr marks along mid-dorsal ridge ahead of dorsal fin.
14. (10) Maxillary short, not reaching past posterior margin of eye.
15. (11) No hyoid mark under lower jaw. Few or no spots on tail.

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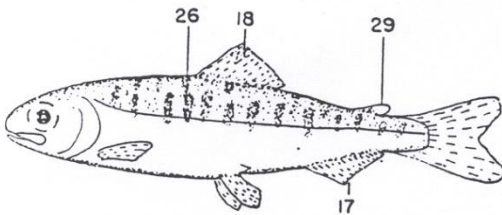
20. (16) Parr marks present as vertical bars or oval spots.
 21. (30) Parr marks short, extending little, if any, below lateral line.
 22. (25) Gill rakers on first arch, 19 to 26.
 ** Pyloric caeca, 140 to 186.
 23. (26) Parr marks faint. Sides below lateral line iridescent green.
 24. (27) Small when migrating from fresh water, approximately 1.5 inches (40 mm) long.

Chum salmon
(*O. keta*)



25. (22) Gill rakers on first arch, 30 to 40.
 **Pyloric caeca 60 to 115.
 26. (23) Parr marks usually sharply defined. Sides below lateral line silvery, not iridescent green.
 27. (24) Relatively large when migrating from fresh water, approximately 3 to 5 inches (80 to 126 mm) long.
 28. (31) Gill rakers long and slender, more than 29 on first arch.
 29. (32) Adipose fin clear, not pigmented.

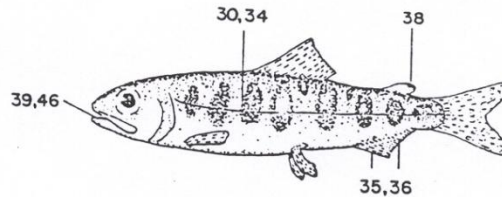
Sockeye salmon
(*O. nerka*)



30. (21) Parr marks large, vertical bars centered by lateral line.
 31. (28) **Gill rakers short and thick, fewer than 29 on first arch.
 32. (29) Adipose fin at least partially pigmented.
 33. (40) **Pyloric caeca more than 90.
 34. (41) Parr marks broader than interspaces.
 35. (42) Anterior rays of anal fin not distinctly longer than rest, not white edged.

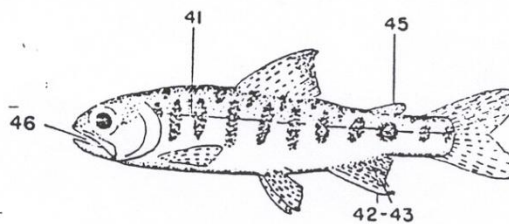
36. (43) Anal fin not pigmented.
 37. (44) Black spots, when present, on both lobes of caudal fin.
 38. (45) Adipose fin not completely mottled, clear area at anterior base of fin.
 39. (46) Black gums along base of lower teeth.

Chinook salmon
(*O. tshawytscha*)



40. (33) **Pyloric caeca less than 80.
 41. (34) Parr marks narrower than interspaces.
 42. (35) Anterior rays of anal fin elongated; when depressed they extend to base of last ray. (Fig. 2B)
 43. (36) Anal fin pigmented between rays, resulting in black banding.
 44. (37) Black spots, when present, on upper lobe of caudal.
 45. (38) Adipose fin completely pigmented.
 46. (36) Mouth gray to white.

Coho salmon
(*O. kisutch*)



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47. (1) Adipose fin not present; scales present or lacking.
Not Salmonidae
48. (2) No fleshy appendage at base of pelvic fins.
Smelts
Family Osmeridae
49. (3) Mouth small, not reaching center of eye; teeth weak or absent.
50. (51) Depressed dorsal fin, shorter than head.
Whitefishes
Genus *Coregonus*
51. (50) Depressed dorsal fin, longer than head.
Arctic grayling
(*Thymallus arcticus*)
52. (5) **Teeth on head of vomer only.
Charrs
Genus *Salvelinus*
Dolly Varden (*S. malma*)
53. (7) Adipose fin orange; row of distinct pale round spots along lateral line.
Brown trout
(*Salmo trutta*)

ACKNOWLEDGMENTS

We especially thank Dr. Arthur D. Welander, Professor of Fisheries, and Dr. Bruce S. Miller, Research Biologist, College of Fisheries, University of Washington, Seattle, for their valuable suggestions. We also thank Galen H. Maxfield, Fishery Biologist, and Dr. Alan J. Beardsley, Fishery Biologist, both from the NMFS Northwest Fisheries Center, Seattle.

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